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SPOKANE RIVER BASIN, 1952

Public Health Service
Portland, Oregon

1952

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Water Pollution Series No. 37

Report On Water Pollution Control

SPOKANE RIVER BASIN

1952

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Spokane
Ocean
Pacific
WASH.
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IDAHO
Snake River
WYO.
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REPORT ON WATER POLLUTION CONTROL

SPOKANE RIVER BASIN

1952

A COOPERATIVE STATE - FEDERAL REPORT

Prepared by:
Pacific Northwest Drainage Basins Office
Division of Water Pollution Control
Public Health Service - Federal Security Agency

In Cooperation With
Idaho Department of Public Health
Washington Pollution Control Commission

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INTRODUCTION

The Federal Water Pollution Control Act, Public Law 845, passed by the 80th Congress in June 1948, requires the Surgeon General of the Public Health Service to cooperate with other Federal agencies, with State and interstate water pollution control agencies and with municipalities and industries in the preparation or adoption of comprehensive programs for eliminating or reducing the pollution of interstate waters and tributaries thereof, and improving the sanitary condition of surface and underground waters.

In developing these programs, due regard must be given to improvements necessary to conserve the Nation's waters for public purposes, agricultural, and other legitimate uses.

Recognizing the fact that full technical information was not available to permit the development of such comprehensive programs immediately for most of the Nation's waters, the Public Health Service envisioned the development of a series of reports to cover the interim period prior to the development of comprehensive water pollution control programs. The first of these reports were the Summary Reports which were prepared for the 15 major drainage basins of the country on the basis of information readily available as of July 1, 1950. The second group of reports of this series, of which this is one, are reports on several sub-basins of the country's major drainage basin areas. Since development of comprehensive water pollution control programs is to proceed as rapidly as conditions permit, only a limited number of these interim sub-basin reports are to be completed, and the majority of these will be for interstate sub-basin areas. These reports are based on available data, and will provide a reference point for measuring progress; provide a guide to needed additional data; provide a basis for the logical development of comprehensive programs; provide a basis for approval of loans to States, interstate agencies and municipalities at such time as the Congress makes available funds for this purpose; and serve to inform the public on the water pollution control problem and needs for the sub-basin concerned.

This report is based on data available as of January 1, 1952, and has been compiled through and in cooperation with the Idaho State Department of Public Health and the Washington State Pollution Control Commission, but should not be considered a detailed engineering investigation of the Spokane River Basin. Through these two agencies additional data have been obtained from other State officials, county and city officials and representatives of industry. Federal agencies also have been of great assistance.

~~in the study~~

The sub-basin reports present information about the ways the water resources of the area are used, the pollution entering those water resources and the resulting damages, the benefits which may result from pollution prevention and abatement, pollution prevention measures now in effect, and those which appear to be needed.

Since the sub-basin reports are based on data which are presently available, they do not discuss the present and future best uses of the waters of the sub-basin as such uses are related to pollution control. Such considerations will be included as a part of the comprehensive water pollution programs which will be developed later.

The deficiencies in data and the gaps in information indicated in these sub-basin reports are as significant as the presentation of available facts and statistics. They indicate the work that still needs to be accomplished by water pollution control authorities for the preparation of comprehensive programs.

Data and knowledge now available are sufficient, however, to permit the immediate solution of many of the pollution problems within the Spokane River Basin without awaiting the results of additional surveys and studies.

A sincere effort has been made by all who contributed to this report to present a fair picture of the complex water pollution problems in the Spokane River Basin.

ACKNOWLEDGMENTS

The Public Health Service wishes to acknowledge the cooperation of those agencies and individuals who have contributed to the preparation of this report.

The Idaho State Department of Public Health and the Washington State Pollution Control Commission furnished the basic information and actively cooperated in the preparation of this report. The Idaho Departments of Fish and Game and Reclamation; the Idaho Mining Association; and the Washington State Department of Health also furnished valuable data and assistance.

Federal agencies from whom assistance was obtained include: The Corps of Engineers, Department of the Army; the Bureau of Reclamation, Fish and Wildlife Service, and Bureau of Mines, Department of the Interior; and the Soil Conservation Service, Department of Agriculture.

SUMMARY

The Spokane River Basin is unlike most drainage areas of the Pacific Northwest in that each of its four principal natural resources—agricultural lands, forests, minerals, and water—is of nearly equal importance in the basin's economy. In 1950, about 273,000 people were living in the basin.

Forest lands cover 77 percent of the basin's area and have a sustained annual yield of about one-quarter billion board feet of timber. Nearly 22 percent of the land area is devoted to agriculture. The gross farm income was approximately 23 million dollars in 1944. The Coeur d'Alene mining district in Idaho has produced mineral wealth valued at more than one billion dollars. Its annual production value was more than 50 million dollars in 1949.

The basin's chief manufacturing enterprises are located near Spokane, Washington. During World War II this area was highly industrialized. Because of its close proximity to Grand Coulee Coulee Dam and the availability of low cost hydroelectric power, industry has continued to expand since the War. The population (1950) of Spokane County was 221,000, which represents an increase of more than 57,000 or 35 percent in the ten-year period 1940 to 1950.

Water has played an important part in the basin's economic development. In addition to its primary use for domestic and industrial purposes, it is used for power generation, recreation, irrigation, livestock watering, and the propagation of fish and wildlife. One of the few public utilities in the country whose power generation facilities are entirely hydroelectric is located in this basin. Water provides recreation for thousands of people and encourages a tourist trade from outside the basin valued at 20 million dollars annually. About 26,000 acres of land are under irrigation in this basin.

Surface water supplies are available for domestic and industrial uses throughout most of the basin. In addition to these, there is an abundant supply of ground water of excellent quality in the vicinity of Spokane, Washington.

In 1951, the total estimated water requirements for domestic and industrial uses averaged 148 million gallons daily during the summer months. Of this total, only 20 percent or about 30 million gallons was obtained from surface sources. The remainder is derived from ground water resources, principally in the area around Spokane.

The major sources of pollution in the Spokane River Basin are the discharge of raw sewage from 174,000 people, treated sewage from 15,000 people, wastes from a sulphite pulp and paper mill and a variety of other industrial plants, and the tailings from ore concentration mills. The total known organic waste load presently being discharged to the watercourses of the basin has a population equivalent of 400,000, ninety-five percent of which is discharged to the Spokane River in the vicinity of Spokane, Washington. Four industries discharge organic wastes of undetermined strength and 31 others inorganic wastes with polluting characteristics. Approximately 500,000 tons of tailings are discharged annually into the South Fork of the Coeur d'Alene River by ore concentration mills.

During a greater part of the year most streams, with the exception of Coeur d'Alene River, are clear, but at times, particularly during the spring run-off, some carry large quantities of silt and debris. Erosion is particularly serious in the Palouse soils of the southwestern part of the basin and in the burned and cut-over forest lands along the South Fork of Coeur d'Alene River.

Domestic and industrial pollutional damages are confined principally to the South Fork of the Coeur d'Alene River below Mullan, Idaho, the Coeur d'Alene River below the mouth of the South Fork; and the Spokane River below Millwood, Washington. Pollutional damages from mill tailings are confined principally to the South Fork of the Coeur d'Alene River below Mullan and the Coeur d'Alene River between the mouth of the South Fork and Cataldo. The mine operators in the Coeur d'Alene mining district operate a dredge at Cataldo for the purpose of removing mill tailings and other debris which settle in the slack current of the Coeur d'Alene River in this area. Wastes which are carried by the river beyond this point are extremely fine and do not settle until they reach the quiet water in Coeur d'Alene Lake. Pollutional wastes which enter these water courses have affected the drinking water supply of Harrison, Idaho, and destroyed all fish and aquatic life in the South Fork of the Coeur d'Alene River below Mullan, Idaho. Pollution contributed to the Spokane River at Millwood, Washington and at downstream points has seriously impaired the value of the Spokane River for fish propagation; retarded the development of recreational areas along the Spokane River and Lake Roosevelt; and created nuisance conditions at a number of locations. In addition, the possibility of pollution affecting the water supply of Coeur d'Alene, Idaho, must be recognized.

Municipal sewage treatment works now serve about eight percent of the total sewered population of 186,930. Of a total of 14 municipalities and 4 military establishments having sewerage systems, 5 municipalities and 2 military establishments treat their wastes prior to discharge. With one exception, existing treatment plants are adequate for the populations they now serve. This one plant must have additional facilities if the needed higher degree of treatment is to be provided.

At present, 21 of the 54 industries discharging wastes directly to watercourses have treatment facilities. Thirteen of these facilities provide satisfactory treatment and disposal of their wastes; two are inadequate, and the adequacies of the remaining 6 are undetermined.

Mine owners of the Coeur d'Alene mining district are spending considerable sums of money every year to control pollution of the Coeur d'Alene River and Coeur d'Alene Lake. Some mine owners in the vicinity of Kellogg impound tailings and prevent their entry into the South Fork of the Coeur d'Alene River. In addition, a dredge is operated by the mining companies for the purpose of removing materials which settle in the slack water of the Coeur d'Alene River near Cataldo. Studies should be made of water quality below the dredge.

Present requirements for pollution prevention and abatement in the Spokane River Basin include projects for 16 municipalities and 11 industrial establishments.

The municipal program, estimated to cost $4,500,000 includes the construction of nine new treatment plants to serve a population of 171,530, additional treatment facilities for an existing primary treatment plant serving 3,300 people, and the construction of connections to the sewerage system of the City of Spokane for two military establishments. These projects will provide adequate treatment for domestic sewage and for industrial wastes discharged into municipal sewers. In addition 4 municipalities should construct community sewerage systems and treatment plants to serve 2,150 people.

The present industrial program is estimated to cost $350,000. It includes new treatment plants or other control measures for six industries and the construction of connections to the Spokane sewerage system for five other industries.

In addition, the industrial program includes the installation by industries connected to municipal sewers of necessary waste prevention facilities to meet the requirements of the pollution control agencies in Idaho and Washington.

The collection of additional data, determination of treatment needs for industries, administration of regulations for waste prevention and treatment, and the supervision of operation of treatment plants are also included in the overall program for water pollution control of the States of Idaho and Washington.

State pollution control agencies are seriously handicapped in developing and carrying out their programs by a lack of personnel and funds for surveys, studies, and investigations.

Lack of adequate pollution control legislation in the State of Idaho may delay the prosecution of an effective abatement program in that State. No single State agency in Idaho is responsible for control of water pollution for all uses and the powers delegated to the various agencies interested in the conservation of water resources are limited, particularly as they apply to industrial wastes.

CONCLUSIONS

1. Water pollution caused by the discharge of raw sewage from municipalities and tailings from ore concentrations mills into the South Fork of the Coeur d'Alene River and the discharge of raw sewage and industrial wastes into the Spokane River at and near Spokane, Washington, are seriously damaging portions of the basin's valuable water resources (see Map 3). Principal known damages caused by discharge of mill tailings are confined to the South Fork of Coeur d'Alene River below Mullen, some tributaries of the South Fork, and the Coeur d'Alene River between the mouth of the South Fork and Cataldo. Pollution of the Coeur d'Alene River below Cataldo is reduced by settling of mill tailings and other debris in the slack water of the Coeur d'Alene River in this area.

2. The principal uses of the water resources of the basin are for domestic, industrial and agricultural water supply, hydroelectric power generation, fish and wildlife propagation, and recreation.

3. Specific pollution prevention and abatement needs in the basin include: (1) Collection of additional survey data; (2) determination of treatment needs for all industries; (3) administration of regulations for waste prevention and treatment; (4) construction of municipal and industrial waste prevention and treatment facilities; and (5) the supervision of operation of treatment plants.

4. Present conditions as to water quality, bottom sediment, and fish and other aquatic life, are largely unknown in Lake Coeur d'Alene and the Coeur d'Alene River below Cataldo.

5. The larger industries constructed in the vicinity of Spokane, Washington, during World War II are in most cases providing adequate treatment of wastes.

6. In the Coeur d'Alene mining district a considerable sum has been spent by mine owners for dredging in the Coeur d'Alene River. Several mills are using tailing ponds and one returns a portion of its tailings to the mine.

7. Soil erosion during spring run-off periods is serious, particularly in soils of the southwestern part of the basin and in the Coeur d'Alene River system.

8. State pollution control agencies are seriously handicapped in developing and carrying out their programs by a lack of sufficient personnel and funds for surveys, studies, and investigations.

9. Lack of adequate pollution control legislation in Idaho is a handicap toward an action program in pollution abatement in that State.

RECOMMENDATIONS

From a consideration of all available information, including the planned programs of State pollution control agencies and other State and Federal agencies, which have served as a basis for this report, it is recommended that:

1. The following municipal and industrial waste treatment plants or other water pollution control projects be constructed as rapidly as possible:

Name	Available Data On Pollutional Loads (Population Equivalent)	Project Requirement
Municipal (Idaho)		
Kellogg	4,100	New plant
Wallace	3,100	New plant
Mullan	2,000	New plant
St. Maries	2,100	New plant
Silverton	400	New plant
Avery	210	New plant
Harrison	40	New plant
Wardner	750	Sewerage system and treatment plant
Burke	550	Sewerage system and treatment plant
Mace	400	Sewerage system and treatment plant
Gem	450	Sewerage system and treatment plant
Subtotal	14,100	
Municipal (Washington)		
Spokane	197,500	New plant
Millwood	180	New plant
Cheney	3,300	Additional treatment
Geiger Field	Variable	Connect to Spokane municipal system
Ft. George Wright	Variable	Connect to Spokane municipal system
Subtotal	200,980	
TOTAL MUNICIPAL	215,080	

Name	Available Data On Pollutional Loads (Population Equivalent)	Project Requirement
Industrial (Washington)		
Inland Empire Paper Co., Millwood	130,000	New plant*
Armour & Co., Spokane	29,000	New plant*
Swift & Co., Spokane	10,000	New plant*
Spokane Rendering Co. Spokane	Unknown	New plant*
Acme Sand & Gravel Co., Spokane	**	New plant*
Union Sand & Gravel, Spokane	**	New plant*
Sicks' Spokane Brewery, Spokane	12,000	Connect to Spokane municipal system
Spokane Toilet Supply Co., Spokane	1,200	Connect to Spokane municipal system
Spokane Flour Mills Spokane	1,000	Connect to Spokane municipal system
Crystal Laundry Co., Spokane	800	Connect to Spokane municipal system
United Creamery, Spokane	190	Connect to Spokane municipal system
Total Industrial	184,190	
GRAND TOTAL	399,270	

---

* New treatment plant or other pollution control measures

** Inorganic wastes.

2. All industries be required to use waste prevention and recovery measures and, when necessary, treatment prior to discharge of wastes.

3. The States adopt water quality objectives commensurate with present and foreseeable water uses.

4. Surveys for determining the sources and the volumes and strengths of wastes now entering watercourses be completed as rapidly as possible.

5. A comprehensive survey of water quality, bottom conditions, and fish and other aquatic life, be conducted to cover Coeur d'Alene Lake, and Coeur d'Alene River below Cataldo, to determine the effect of pollution on natural stream purification factors.

6. Surveys of Coeur d'Alene River above Cataldo, Hayden Lake, Spirit Lake, and the Spokane River be continued and expanded sufficiently to determine more accurately the year-around condition of these waters.

7. Coordinated research studies by the mining industry and State Pollution Control Agency be undertaken in the hope that satisfactory and economically feasible methods for the disposal of mining and ore processing wastes can be found.

8. Upon completion of the necessary surveys, research investigations, and studies, treatment requirements be determined for ore mining and concentration mills of the Coeur d'Alene mining district.

9. The States provide adequate funds to pollution control agencies for employment of technical personnel in order to complete the necessary surveys and determine the treatment needs of all industries.

10. The State of Idaho provide adequate water pollution control legislation and designate a single State agency to administer the laws relating to water pollution.

11. The States, and through the States, the Federal Government, provide technical advice and assistance to the Coeur d'Alene mine owners who are spending considerable money and employing various treatment measures to control pollution of Coeur d'Alene Lake.

12. In order to obtain greatest benefits, all water resource developments in the basin be effectively coordinated between State and Federal agencies.

13. Soil conservation and flood control programs of the Soil Conservation and Forest Service of the Department of Agriculture be continued.

HISTORICAL BACKGROUND

Early fur traders who entered what was later known as the Spokane River Valley found a tribe of Indians residing at the spot where Spokane is now located. The Indians, as well as the river, bore the name Spokane. This Indian word has been interpreted to mean "Chief of the Sun."1/

David Thompson, explorer and trader of the Northwest Company, built a trading post in 1810 at the junction of the Spokane and Little Spokane Rivers. This post was called "Spokane House" and from it trading operations were extended out to the surrounding areas. Americans from Fort Astoria were preparing to build a competing fort nearby when their plans had to be abandoned as a result of the War of 1812.2/

Fur trading was the only significant activity of white men in the area for the next few decades. The work of missionaries, however, who were located in the region had considerable effect on subsequent events. The Indians were taught farming and other occupations by the Spalding and Whitman Missions located outside the basin. In 1831 Father Peter DeSmet founded a mission on the St. Joe River near the southern end of Lake Coeur d'Alene. He was of great service to the government as a pacificator of hostile Indian tribes and did much for the Indians in the area.

One of the wildest stampedes in the history of mining occurred with the rush to the Coeur d'Alene area early in 1884. No roads entered this region and the miners trudged through deep snows in the dead of winter to reach the gold fields. Real mining development started with the discovery of the first quartz strike in the famous lead-silver belt on the South Fork of the Coeur d'Alene River. The fabulously rich Bunker Hill and Sullivan mine was located at Wardner in 1885. These mines have been astonishingly heavy producers and today this district is the richest lead-silver district in the United States.3/

1/ Downie, Ralph E., "Pictorial History of State of Washington," Lowman E. Hanford Company, Seattle, Washington, 1937.

2/ Barto, Harold E. and Catherine Bullard, "History State of Washington," D. C. Heath & Co., Boston, Mass., 1947, p. 181.

3/ Brosnan, C. J., "History of Idaho," C. Scribners & Sons, 1918, pp. 77-100.

PHYSICAL DESCRIPTION

Geography

The Spokane River Basin includes an area of 6,640 square miles in northern Idaho and northeastern Washington.1/ The basin is roughly elliptical in shape with its major axis extending from the Bitterroot Mountains on the Idaho-Montana boundary to the junction of the Spokane and Columbia Rivers in Washington. Coeur d'Alene Lake in Idaho receives drainage from the easterly half of the basin. The Spokane River is the outlet of Coeur d'Alene Lake and has its source at the north end of the lake. The Spokane flows westerly from the lake about 100 miles, traversing about 94 miles of Washington before joining Franklin D. Roosevelt Lake on the Columbia River. About 4,350 square miles of the basin lie within the State of Idaho and 2,290 square miles in Washington.

Topography

The terrain of the basin varies from mountains and deep valleys in its eastern portion to rolling plateaus and prairie toward the west. The portion of the basin above Coeur d'Alene Lake, except for the lower portion of Coeur d'Alene and St. Joe Rivers, is generally mountainous and rugged. To the northwest and the south the terrain is a rolling plateau that descends abruptly into a central, glaciated trough. West of Spokane the basin consists of high table lands with deeply eroded valleys. To the south there are rolling aeolian plateaus with elevations of about 2,500 feet. North of the river these plateaus are higher, more rugged, forested areas with elevations exceeding 5,000 feet.

The numerous natural lakes of the basin have a total surface area of 53,120 acres. The largest of these is Coeur d'Alene Lake. Hayden Lake is next in size. Numerous other lakes, mostly land-locked and draining into the underlying porous gravel deposits, are scattered throughout the basin.

Principal tributaries of Coeur d'Alene Lake are the St. Joe and Coeur d'Alene Rivers. These rivers originate on the western slopes of the Bitterroot Mountains at elevations above 6,000 feet. Slopes are steep at the headwaters and relatively flat in the lower reaches above Coeur d'Alene Lake.

The Spokane River has a generally flat gradient except at Spokane and Post Falls and three other falls downstream from Spokane. The Spokane Falls drop is about 133 feet and that at Post Falls is 55 feet. Franklin D. Roosevelt Lake extends upstream nearly to the base of

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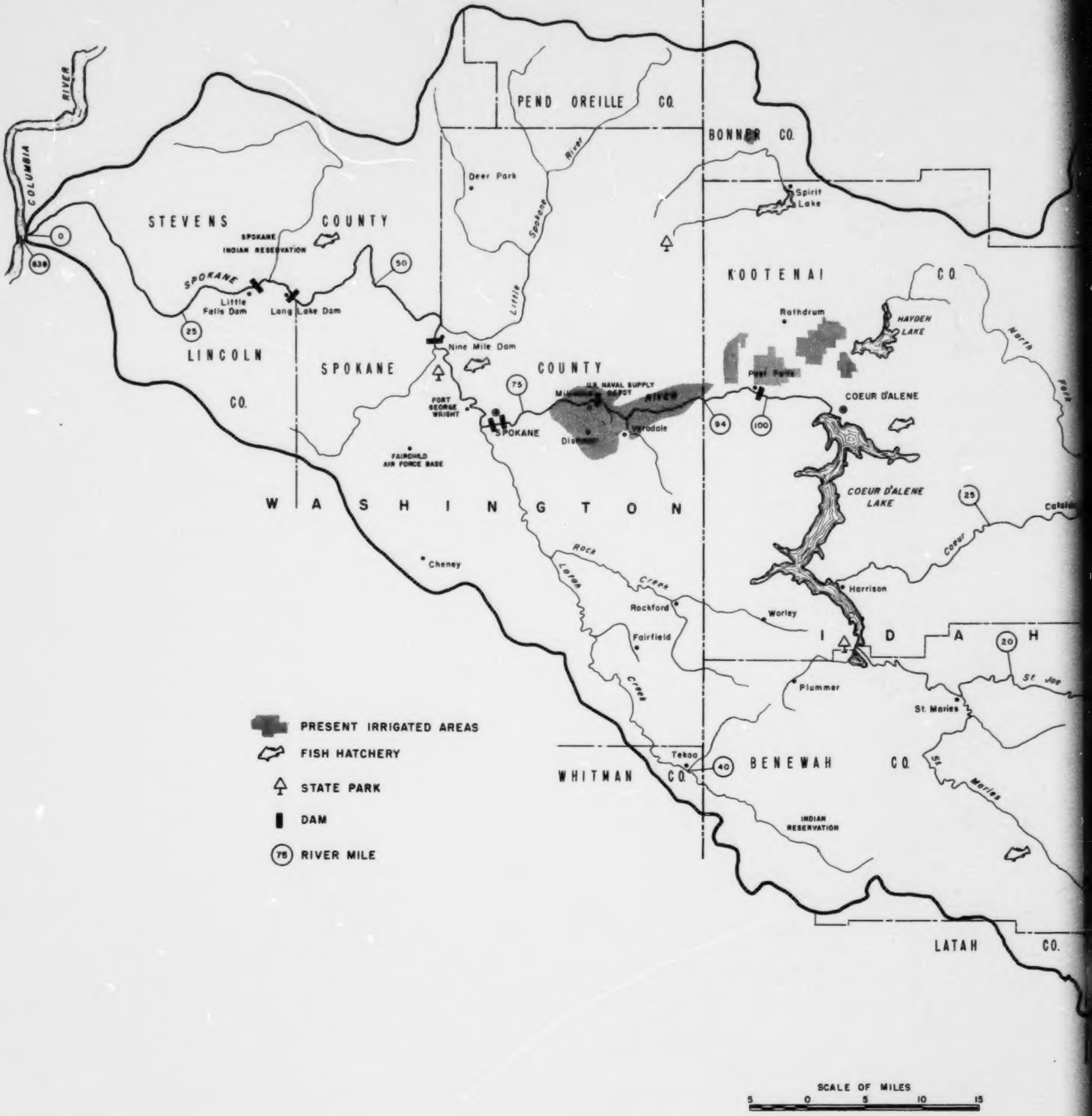
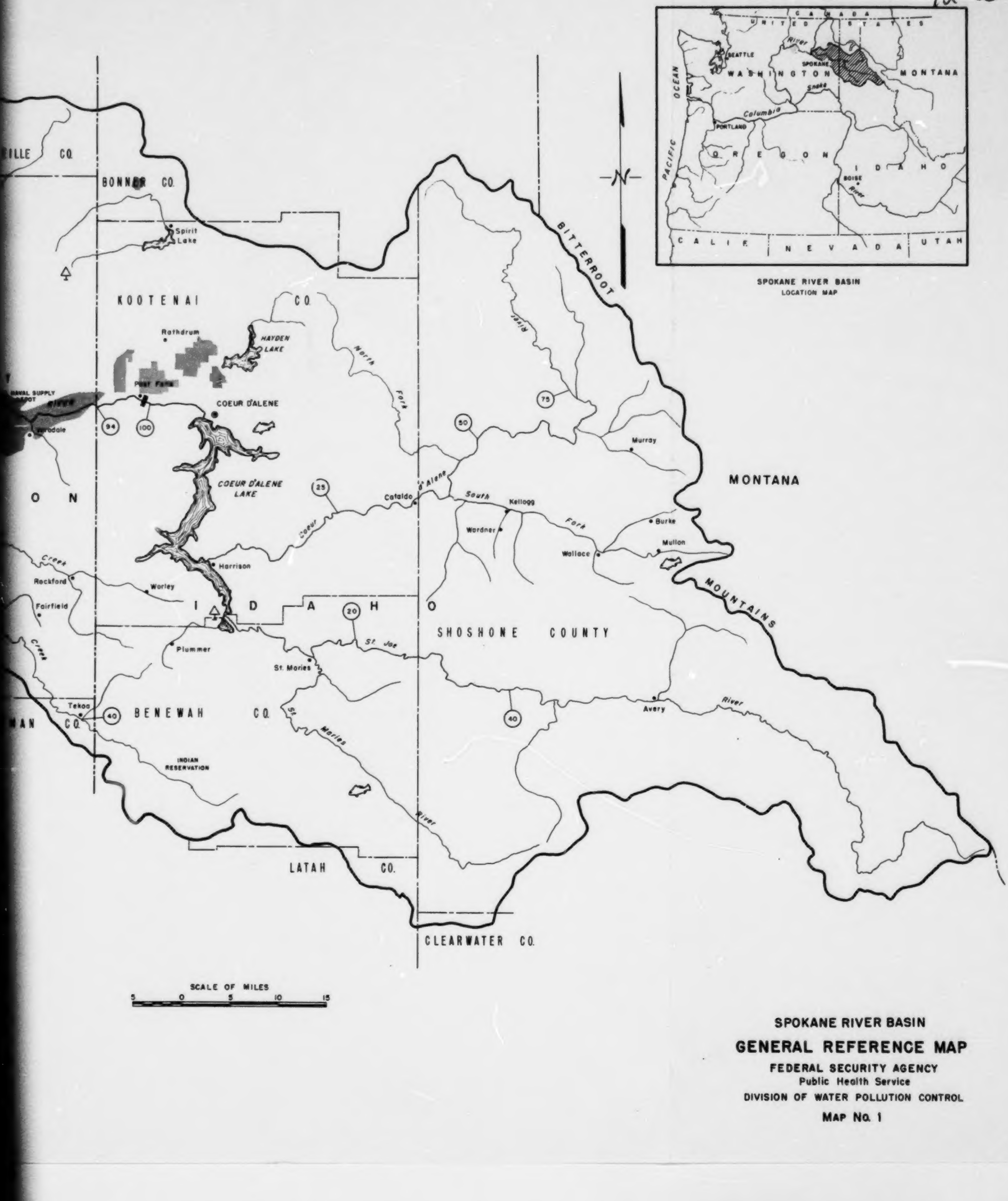
1/ See General Reference Map (No. 1).



COLUMBIA RIVER
PEND OREILLE CO.
BONNER CO.
STEVENS COUNTY
SPOKANE INDIAN RESERVATION
SPOKANE
Little Falls Dam
Long Lake Dam
Deer Park
Spokane River
Little Spokane
Spirit Lake
KOOTENAI CO.
Rathdrum
HAYDEN LAKE
North Fork
Nine Mile Dam
LINCOLN CO.
SPOKANE COUNTY
FORT GEORGE WRIGHT
U.S. NAVAL SUPPLY DEPOT
RIVER
Post Falls
COEUR D'ALENE
SPOKANE
Dishman
Veradale
FAIRCHILD AIR FORCE BASE
COEUR D'ALENE LAKE
WASHINGTON
Coeur
Cataldo
Rock Creek
Latah Creek
Cheney
Rockford
Fairfield
Harrison
Worley
IDAH
St. Joe
Plummer
St. Maries
St. Maries
WHITMAN CO.
Tekoa
BENEWAH CO.
INDIAN RESERVATION
LATAH CO.
0
25
50
75
94
100
25
20
40
638
PRESENT IRRIGATED AREAS
FISH HATCHERY
STATE PARK
DAM
75 RIVER MILE
SCALE OF MILES
5
0
5
10
15


CANADA
UNITED STATES
SEATTLE
WASHINGTON
SPOKANE
River
Snake
MONTANA
PACIFIC OCEAN
PORTLAND
Columbia
OREGON
IDAHO
BOISE
River
CALIF.
NEVADA
UTAH
SPOKANE RIVER BASIN
LOCATION MAP
N
BITTERROOT
MOUNTAINS
MONTANA
BONNER CO.
Spirit Lake
KOOTENAI CO.
Rathdrum
HAYDEN LAKE
Post Falls
NAVAL SUPPLY DEPOT
River
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COEUR D'ALENE
COEUR D'ALENE LAKE
North Fork
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Murray
Cataldo
Coeur d'Alene
South Fork
Kellogg
Wardner
Burke
Mullon
Wallace
Coeur
Creek
Rockford
Harrison
Worley
Fairfield
I D A H O
20
SHOSHONE COUNTY
Creek
Plummer
St. Joe
St. Maries
Tekoa
40
BENEWAH CO.
St. Maries
INDIAN RESERVATION
40
Avery
River
River
LATAH CO.
CLEARWATER CO.
SCALE OF MILES
5
0
5
10
15

SPOKANE RIVER BASIN

GENERAL REFERENCE MAP

FEDERAL SECURITY AGENCY
Public Health Service
DIVISION OF WATER POLLUTION CONTROL

MAP No. 1

Little Falls, about 32 miles above the original junction of the Spokane and Columbia Rivers. Principal tributaries of the Spokane River are Little Spokane River, Chamokane and Latah Creeks.

Climate

The climate of the Spokane River Basin is subject to the moderating influence of the prevailing winds from the Pacific Ocean. Precipitation is heavy during winter and comparatively light during summer. Recorded mean annual precipitation varies from 13.81 inches at Fort Spokane, Washington, to 49.74 inches at Roland, Idaho. Snowfall averages 261 inches also at Roland, Idaho. The extreme westerly portion of the basin is semi-arid.

Mean annual temperatures vary from 40.4 degrees F. at Burke, Idaho, to 48.5 degrees F. at Cheney, Washington. A minimum temperature of minus 42 degrees F. has been recorded at Deer Park, Washington, and a maximum of 109 degrees F. at Kellogg, Idaho. Spokane, Washington, has a growing season averaging 183 days.

Hydrology

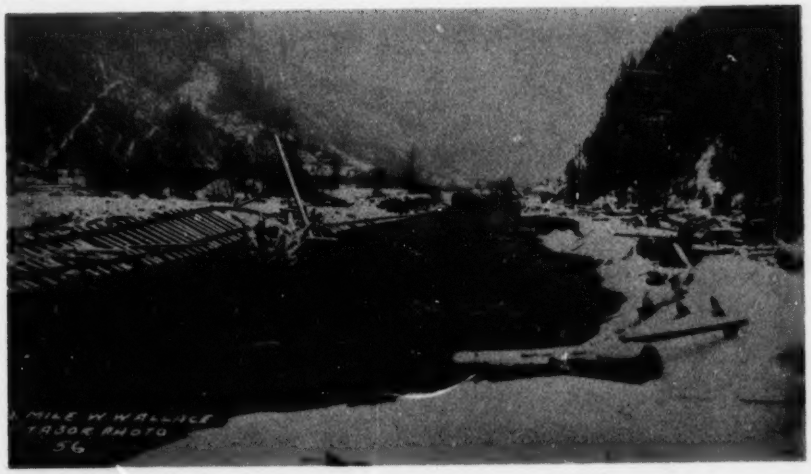
During the period 1926 to 1945 inclusive, the average annual flow of the Spokane River at Spokane was 5,834 cubic feet per second and that of the Coeur d'Alene River at Cataldo was 2,201 cubic feet per second. High run-off occurs during the winter and spring months. July, August, and September are the months of minimum flows in the Spokane River. For ten percent of the time, flow of the Spokane River at Spokane does not exceed 1,700 cubic feet per second.

Some control over flows in the Spokane River is exercised by the Washington Water Power Company through regulated releases from Coeur d'Alene Lake. However, as these releases are made primarily for power production, they do not greatly affect the flows available during late summer months for dilution of sewage and industrial wastes.

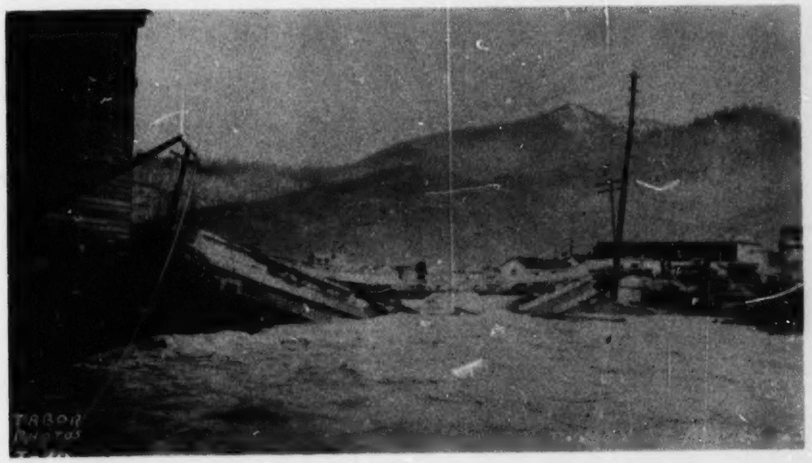
A substantial ground-water supply enters the Spokane and Little Spokane Rivers near Spokane. It is believed that this underground supply is fed from Pend Oreille Lake and other smaller lakes and streams in northern Idaho. The water travels through pervious gravels underlying Rathdrum Prairie and the Spokane River Valley until it reaches the vicinity of Spokane where it appears in springs. It has been estimated that the flow is about 1,000 cubic feet per second. These ground-water resources tend to maintain the flow of Spokane River at a higher level than would normally prevail during the low-flow period. An average of over 135 cubic feet per second is pumped from wells tapping this supply for domestic, industrial, and irrigation uses.

Except that portion of Rathdrum Prairie where the ground water is at great depth, there are few places in the Idaho portion of the basin where ground-water supplies are available or satisfactory for domestic use.

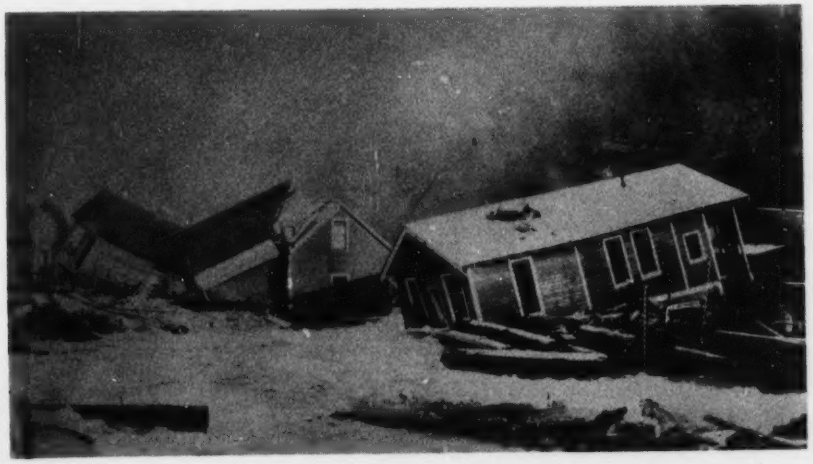
Unusually severe floods have occurred on the South Fork of Coeur d'Alene River. These flood waters rushing from wall to wall along the river canyon have uprooted trees, washed out bridges, highways and railroads and destroyed buildings. The debris, including the tailings from concentration plants are washed downstream, some being deposited along the banks of the lower river.



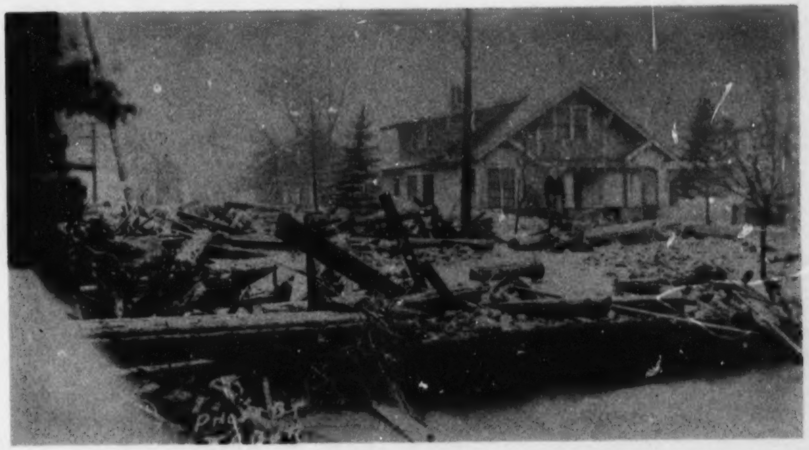
UNION PACIFIC RAILROAD AND U. S. HIGHWAY NO. 10. COMPLETELY OBLITERATED FOR MILES BETWEEN WALLACE AND HARRISON, IDAHO. RESULT OF FLOOD OF DECEMBER 23, 1933.



MASSIVE CONCRETE BRIDGE AT DIVISION STREET, KELLOGG, IDAHO WRECKED AND DEMOLISHED RESULT OF FLOOD OF DECEMBER 23, 1933.



PLACER CREEK. RESULTS OF FLASH FLOODS. MANY HOMES WASHED AWAY. DECEMBER 15, 1915.



WRECK AND DEVASTATION CAUSED BY SERIOUS FLOOD OF DECEMBER 23, 1933. HOMES ON PLACER CREEK, WALLACE, IDAHO.

ECONOMIC DEVELOPMENT

Unlike most areas in the Pacific Northwest each of the four natural resources--agricultural lands, forests, minerals, and water--is of nearly equal importance to the basin's economy.

Developments of land resources have not been so dependent upon the use of the water resources as they have in many other basins of the Pacific Northwest. Although very important in the overall development of land resources, surface waters have been used primarily for furnishing power and as a means for disposal of domestic and industrial wastes.

Land Uses and Resources

The total land area within the basin is slightly more than 4.2 million acres. Of this area, 3.2 million acres, or 77 percent, are covered by forest and 0.9 million acres, or 22 percent, are devoted to agriculture. The remainder is range, waste, or used for miscellaneous purposes.

About 62 percent of the basin's forest lands in Idaho and 23 percent in Washington are under public ownership. Both privately-owned and public forest lands contain about 12.5 billion board feet of saw timber.

Principal mineral deposits are located along the South Fork of the Coeur d'Alene River. They include zinc, lead, silver, cadmium, antimony, gold, and copper. Deposits of iron, manganese, molybdenum, silica, silica sand, and tungsten are found in scattered areas of the basin.

Population

The 1950 population of the basin was 273,000. This represented an increase of about 27 percent during the period 1940-1950. About two-thirds of this number is urban and one-third rural. Spokane, Washington, is the largest city in the basin and the center of industrial activities and of the Inland Empire. Its estimated 1951 population of 168,000 represents an increase of 8,000 since the 1950 Census.

A total of 77,216 people were employed within the basin in 1940. Of this total, 19 percent were employed in the extractive industries, 13 percent in the processing industries, and about 67 percent in service industries. The occupations of about one percent of the employed people were unclassified.

Agriculture

Agricultural products in 1944 had a gross value of nearly 23 million dollars. Of this amount, 34 percent was derived from the sale of livestock and livestock products, and 57 percent from the sale of crops and forest products. The remainder was the value of products used by farm households. The 1945 census of agriculture reported 7,070 farms in the basin covering an area of about 1.5 million acres and valued, including lands and buildings, at over 69 million dollars. Only 656,359 acres of the total farm land were used for crop production and about 26,000 acres were irrigated at that time. About 8,000 people were employed in agriculture in 1940.

Industry

Mining and mineral production are very important in the basin's economy. In 1949 the Coeur d'Alene mining district produced more than 50 million dollars worth of gold, silver, copper, lead, and zinc.[1] During this year 32 mines were operating. Included in this group were the world's largest silver mine and the first and third largest lead producing mines. The Coeur d'Alene mining district is one of eight metal mining areas of the world having produced mineral wealth in excess of one billion dollars. About 7,500 people were employed in mining operations in 1949. The mining companies' annual payroll is about 26 million dollars.

About 260 million board feet of saw logs were cut in 1946. These logs were used in producing lumber, match blocks, cross ties, mine timber, poles and piling, fuel wood, pulp and shingle bolts. Principal species harvested were Ponderosa pine, Douglas fir, western white pine, western larch, balsam fir, Engelmann's spruce, western red cedar, western hemlock and lodgepole pine.

Manufacturing: In 1947 there were 340 plants processing agricultural, forest, and mineral products. The total value added to products by manufacturers was over 77 million dollars. There were more than 13,000 wage earners engaged in manufacturing enterprises. Except for large sawmills located at Post Falls, Coeur d'Alene, Harrison, and St. Maries, Idaho, the principal manufacturing enterprises are centered in and near Spokane, Washington.

Spokane, Washington, sometimes called the capitol of the Inland Empire, was heavily industrialized during World War II and has expanded rapidly since the start of the Korean War. Aluminum reduction and rolling mills which were constructed in the vicinity of Spokane during World War II have been operated continuously since the war. The magnesium plant constructed during World War II has again been placed in operation.

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[1] Idaho Mining Association data.

Transportation

Adequate transportation by trunk line highways, railroads, and airways is available in the basin. Most of these facilities serving the Northwest converge at Spokane, Washington.

Recreation

Spectacular scenery, vast forests, attractive lakes and mountain streams are to be found in many places. These make the Spokane Basin a natural recreational area. Fishing, hunting, bathing, boating, and winter sports are favorites, creating an annual seasonal influx of more than a million people from less favored regions. Out-of-state tourist trade in the basin is estimated to gross about $20,000,000 annually.1/

Development of Hayburn State Park south of Coeur d'Alene Lake and Mount Spokane State Park north of Spokane, Washington, are outstanding. Lookout Mountain east of Wallace has been developed principally for winter sports.

1/ Based on data from "The Washington Tourists Survey 1949," Bulletin No. 15, State College of Washington.

USES OF WATER RESOURCES

Water is economically important in the Spokane River Basin although it is not used as extensively for irrigation as it is in most other basins of the Pacific Northwest. It supports one of the few public utilities (Washington Water Power Company) in this country whose power facilities are entirely hydroelectric. In addition, water provides recreation for thousands of people and encourages a tourist trade from outside the basin valued at $20 million annually.

The principal uses of the water resources of the basin are for: domestic and industrial water supply; hydroelectric power; bathing and other recreation; propagation of fish and wildlife; and agricultural purposes.[1]

Domestic

More than 80 separate water systems are used to supply the domestic needs of nearly 262,000 people (See Appendix--Table 9). Some of these systems serve resorts and youth camps which are in operation only during summer months; therefore, the actual basin population using public water supplies is somewhat less than the above figure. In addition to the domestic needs of these people, these water systems supply water to a number of industries for processing use. Water requirements are estimated to average nearly 70 million gallons per day with a summer rate of use of about 115 million gallons per day.

Only two or three small water systems in the Washington portion of the basin use surface sources to supply water for domestic use. The Washington Brick and Lime Company supplies water obtained from Dragoon Creek to 325 people living in Clayton. The domestic needs of 43,260 people living in the Idaho portion are supplied from surface sources by 25 separate systems. The average daily use of surface waters during the dry summer months is about 18 million gallons. Fifty-four water systems serving some 218,000 people depend upon ground water supplies. Sixteen of these are located in Idaho and 38 in Washington. The use of ground waters during the dry summer months averages about 97 million gallons daily.

Lakes and tributary streams are the principal sources for the surface water supplies. Thirteen water systems serving about 25,000 people obtain water from Coeur d'Alene, Hayden, and Spirit Lakes. Seven of these serve youth camps operated only during the summer months. All of the lakes are used extensively for recreation. Some are used for the booming and transportation of logs and other industrial purposes. Although these lake waters are subject to human contamination and pollution from various sources, the degree of pollution has not been adequately determined. There is need for investigation of the pollution of waters in Coeur d'Alene Lake which results from the discharge of wastes from mining operations on the South Fork of Coeur d'Alene River. The water supplies obtained from tributary sources, though less subject to pollution, also need investigation.

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[1] See Existing Primary Water Uses (Map No. 2).

In a portion of this basin in Idaho, ground water supplies are obtainable only at great depth and are not dependable. A number of the communities using wells as the principal source of water supply have auxiliary springs or surface supplies. During summer months the auxiliary sources are commonly used to supplement the well supplies.

Most of the population in Washington is located in areas where it is not difficult to obtain an adequate supply of ground water at shallow depths. It has been estimated that the flow of this underground supply feeding into the Spokane and Little Spokane Rivers from the north and east is about 1,000 cubic feet per second, of which only about 135 second feet is presently being used.

Filtration of water is not a common practice in the Spokane River Basin; but most of the water obtained from surface sources must be disinfected. There are, however, two lake and four tributary supplies that are not disinfected.

Only one of the ground water supplies in Idaho and two in Washington are chlorinated. Five of the auxiliary surface supplies in Idaho, however, are chlorinated during periods of use.

Groundwater from Spokane's Upriver pumping stations, which are adjacent to the Spokane River, has been contaminated during floods and high water in the Spokane River. This occurs because the river water is at an elevation above that of the water in the aquifer and flows outward through the porous gravels. Spokane has recently constructed new wells and pumping stations which are believed to be far enough from the river to avoid contamination.

The City of Spokane (See Appendix, City of Spokane--Waterworks) obtains its water supply from wells which tap the underground stream flowing through the glacial gravels of Spokane Valley. Water is supplied to 168,000 people and to 3,582 commercial and industrial users located in the city and adjacent areas. The pumping capacity of the wells is about 295 million gallons per day. The average daily water demand is about 53 million gallons and the maximum daily use about 114 million gallons. All water is chlorinated prior to use.

Industrial

In addition to water supplied to industries through public water systems, there are known to exist in the basin 72 separate industrial supplies (See Appendix--Table 10). The water demand of these plants is estimated to average 33 million gallons per day.

Surface waters supply the needs of 24 industrial plants. The total demand upon surface sources is 12 million gallons per day.

Extensive use of surface sources is made by ore processing mills of the Coeur d'Alene mining district. As this water is used principally in the flotation process of these mills, the quality requirements are low. Much of the water used contains tailings discharged at upstream mills. Small quantities of surface waters are used at the mines in wet drillings and for cooling purposes. The quality requirements for these uses also are low. The only other large user of surface water is the plant of Potlatch Forests at Coeur d'Alene. Most of the water required at this plant is for cooling purposes.

Ground waters are used by 48 industrial plants, most of which are located in the Spokane Valley area of Washington. It is estimated that about 21 m.g.d. of water is used by these 48 plants. The Bunker Hill and Sullivan Zinc Smelter at Kellogg, Idaho, requires a high quality water which is obtained from 15 wells and treated prior to use. These wells are from 75 to 200 feet deep. Industries located in the Spokane Valley in Washington are obtaining an adequate quantity of good quality water at shallow depths.

Spokane Metropolitan Area[1]

The Spokane Metropolitan area includes all of Spokane County, Washington. This area supports a population of over 220,000, which represents an increase of 34 percent from 1940 to 1950. During the period 1939 to 1947 the number of manufacturing establishments increased from 243 to 267 and the value added by the manufacturer increased from a 19 million dollar rate to 72 million dollars per year.

As during World War II, the Spokane Metropolitan Area assumes a very definite responsibility in connection with national defense production. Its important water supply facilities must be given prime consideration in connection with future industrial expansion in the area. There are at present 38 municipal and 48 industrial sources of water supply in the area. A large number of these, however, are small and should not be considered in connection with available supplies for future industrial expansion. The 20 municipal and 14 industrial supplies included in Table 11, Appendix to this report, indicate a surplus in supply facilities of about 205 m.g.d. or about 134 percent over the present maximum daily demand.

The situation with respect to available water capacity in existing systems is excellent; however, the necessity of utilizing excess capacity in existing systems for future industrial expansion will be governed by material shortages and economic considerations. The quality of the water and its availability in adequate supply should not be critical considerations in the Spokane Metropolitan Area as there are many desirable locations where an abundant supply of good quality water can be obtained either from existing systems or by tapping the underground reservoir. The depths to the water table vary from about 40 to 300 feet throughout most of the valley.

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[1] See Municipal and Industrial Water Supplies--Spokane Metropolitan Area (Map No. 4).

Hydroelectric Power

Existing hydroelectric power installations include seven plants with an installed capacity of 146,950 kilowatts. Six of these plants, having an installed capacity of 142,450 kilowatts, are owned and operated by the Washington Water Power Company. The other plant, with a maximum capacity of 4,500 kilowatts, is operated by the City of Spokane, Washington, for pumping domestic water from its well supply.

The annual output from the six Washington Water Power Company plants is about one billion kilowatt hours, 50 percent of which is firm power.

Proposed upstream storage with hydroelectric power facilities included would more than double the total annual power output and would increase the firm power 2-1/2 times.

Recreation

Coeur d'Alene, Hayden and numerous smaller lakes are within easy driving distance of Spokane. Most of these lakes have become fringed with summer cottages and resorts. Since 1939, when Coeur d'Alene constructed a sewage treatment plant and eliminated insanitary and unsightly conditions at the northern end of Coeur d'Alene Lake, the playground and tourist developments in that area have become extensive. It is now estimated that two-thirds of Coeur d'Alene's income is derived from tourist trade.

Fishing, boating, and summertime bathing in surface waters are popular with both the tourists and residents of the Spokane Basin.

Fish and Wildlife

The Spokane River Basin supports a valuable fishery for whitefish and trout, and many of the lakes have abundant populations of kokanee or land-locked blueback salmon. Native rainbow, eastern brook, and cut-throat trout are propagated in State-owned hatcheries and planted in many of the lakes and mountain streams. Largemouth bass, crappie, bluegill, perch, bullhead catfish, sucker, squawfish and carp inhabit some of the lakes and rivers.

The monetary value of Spokane Basin fishery lies more in the recreational value to the angler and the income from sales of licenses, equipment, services, and accommodations than in the intrinsic value of the fish themselves. However, the value of the annual fish harvest must not be overlooked.

The basin lies in important migratory routes of waterfowl and supports, in addition, a considerable local population of ducks and geese that nest within the area where conditions are suitable. Good hunting for waterfowl may be found in the Spokane Basin. In addition, some big game and upland game hunting are enjoyed.

Agriculture

Agriculture in the basin is confined almost entirely to lands west of Coeur d'Alene Lake and the overflow lands along the St. Maries, St. Joe, and Coeur d'Alene Rivers. A total of 912,844 acres are generally devoted to agriculture and an additional 9,240 acres to livestock range. Only about 28,000 acres are under constructed irrigation works and about 26,000 acres are irrigated during an average year. The estimated annual water requirements are about 67,000 acre feet (See Appendix, Table 12). The proposed Rathdrum Prairie Project of the Bureau of Reclamation will provide water for 35,000 acres of land, including 7500 acres in existing irrigation districts.

When the average annual rainfall of 25 inches is well distributed, good crop returns from dry farming may be expected. This, together with the cost of bringing water to the land, has limited the irrigation developments.

About 15 percent of the 1940 population lived on farms and 10 percent of the employed persons were engaged in farming. The gross farm income for 1944 was about 23 million dollars. Livestock and livestock products accounted for about 34 percent of the total farm income.

Except in the Coeur d'Alene Valley and in streams and creeks below community sewer outfalls, pollution would not appear to be affecting surface waters used for livestock. Mining interests obtained easements from land owners along the Coeur d'Alene River in lieu of paying damages to farmers for livestock and crop losses. Most of the flooded lands are now owned outright by the mine operators.

POLLUTION CONTRIBUTED TO WATER RESOURCES

The principal sources of pollution of the streams and other waters of the Spokane River Basin are domestic sewage and industrial waste. The industrial wastes include those from the manufacture of pulp and paper products, food processing, mining operations, ore concentration and smelting. Silt, sawdust, bark, oil, and grease are also pollutants of the basin's streams.

In the Spokane River Basin there are three principal locations where significant quantities of pollutional wastes are discharged into streams. These are discussed in the following paragraphs.

South Fork of Coeur d'Alene River, Idaho

The Idaho communities of Mullan, Wallace, Silverton, Burke, Mace, Gem, Wardner, and Kellogg, and adjacent locations discharge raw sewage from a population of 11,650, and 25 ore concentration and smelting plants discharge inorganic wastes. In most instances, tailings from the ore concentration mills reach the South Fork of Coeur d'Alene River. These tailings contain small quantities of lead, zinc, iron, manganese, and copper. It has been estimated that approximately 500,000 tons of tailings are discharged to the river annually. Normally these tailings settle on the bottom of the river; however, some turbidity or color is noted in the water as it enters Coeur d'Alene Lake.

Cooperative surveys were made in 1931-1932 by the State of Idaho Department of Welfare, the Federal Bureau of Mines, and the U. S. Public Health Service. Independent surveys were also made by the U. S. Bureau of Fisheries (1932) and the Federal Mining and Smelting Company of Wallace, Idaho (1930). These surveys were limited in scope. They did, however, give an indication of the pollution from mining wastes in Coeur d'Alene Lake and the river.

In these surveys the State Department of Welfare and the Public Health Service determined the lead concentrations in waters of Coeur d'Alene Lake, while the Bureau of Mines confined its activities to the Coeur d'Alene River, St. Joe River, and at individual sources. The study by the U. S. Bureau of Fisheries covered the biological aspects of the problem from the Washington State line upstream into the Coeur d'Alene River. The Federal Mining and Smelting Company survey included more complete chemical analyses of the river and lake waters, as well as a determination of their bacteriological quality.

Lead concentrations found in samples of water analyzed averaged 0.26 and 0.36 parts per million at the Harrison Water Supply intake, and 0.15 and 0.22 parts per million at the Coeur d'Alene water supply intake. The Bureau of Mines reported a sample from the South Fork of Coeur d'Alene River containing 10 parts per million of lead. Monthly tests since 1934 by the Idaho State Department of Public Health on samples submitted by the Washington Water Power Company indicate a range of lead concentration in the Coeur d'Alene water distribution system of from less than .005 p.p.m. to .086 p.p.m. These differences in results at Coeur d'Alene may be due to the following: The operation of the Cataldo dredge which started in 1932; the introduction of the flotation process of ore concentration which removes a larger percentage of valuable minerals; and differences in the technique employed in testing.

Quantities of silver, zinc, iron, and copper in addition to lead were found in both lake and river water by the Federal Mining and Smelting Company. In addition, the Bureau of Fisheries found traces of arsenic and manganese in samples of soil incrustations along the Coeur d'Alene River.

Prior to the years 1930, 1931, and 1932 when these pollution surveys were made, a good many of the concentrating plants were putting coarse gravity tailings into the river. These tailings carried considerable value in lead, zinc, and silver. Since that time all the concentration plants have installed the flotation process and have been discharging finely ground tailings to the river with much smaller content of these valuable minerals.

A summary of pertinent data taken from each of the above listed reports is included in the appendix of this report.

Millwood, Washington

Millwood is located on the Spokane River above Spokane. The Inland Empire Paper Mill, the chief industry of Millwood, discharges its sanitary sewage and, during a portion of the year, all of its mill wastes directly into the river. The population equivalent of all wastes from the plant has been estimated at 130,000, based upon the biochemical oxygen demand. During the summer months, however, about 50 percent of the waste sulphite liquor is used as a dust palliative on streets and roads. This has helped to reduce the pollution entering the river from this plant during the period of low stream flow.

Spokane, Washington

Spokane has about 25 sub-trunk sewers entering the river at various places and, in addition, there are numerous small industries along the river banks which discharge their wastes directly into the stream. The population equivalent of wastes contributed by the City of Spokane is estimated to be 197,500 based upon the biochemical oxygen demand of the combined domestic and industrial wastes discharged to the sewers. In addition, eight industries discharging through separate outlets contribute waste with an estimated population equivalent of 54,210.

For the basin as a whole there are 76 significant sources of pollution. Thirteen of these are municipalities, 4 are military establishments, and 64 are industrial establishments. Based upon the biochemical oxygen demand the combined wastes from the 18 municipalities and 19 of the industries have a total population equivalent of 400,700. Insufficient data are available to determine the pollutional loads of four industries that discharge organic wastes, and the loads due to four military establishments are variable. The remaining sources of pollution are industrial establishments that discharge inorganic wastes.

Basic data on sources of municipal and industrial pollution are included in Tables 1 and 2 of the Appendix. Information on sources and magnitude of polluting wastes is summarized in Tables A and B.

TABLE A

SOURCES OF POLLUTION

MUNICIPAL

Municipalities*	Sources of Pollution in Number of Municipalities*	Population Served by Sewerage System	Amount of Pollution Discharged to Watercourse** (In terms of equivalent number of people)
Having Data on pollution load to watercourse	18***	186,930	216,140***
Military Establishments with variable population (Data on Pollution load to water-course incomplete or not available.)	4	Variable	Variable
TOTAL	22	——	——

*** Includes incorporated or unincorporated municipalities, military establishments, and other population centers.**

**** Includes industrial wastes discharged into municipal sewerage systems.**

*** Includes the raw sewage of 2150 people living in 4 unsewered communities with individual outfalls.

TABLE B

SOURCES OF POLLUTION

INDUSTRIAL

Industries*	Sources of Pollution (In number of plants)	Amount of Pollution Discharged to Watercourse (In terms of equivalent number of people)
Producing Organic Wastes	22**	184,560
Producing Organic Wastes	4	Undetermined
Producing Inorganic Wastes	31	(Not Applicable)
TOTAL	54	----

* Industries having separate outlets discharging wastes directly to watercourse.

** Includes 3 plants also producing inorganic wastes.

The locations of municipal and industrial sources of pollution are shown on Maps No. 5 and No. 6.

Because industrial establishments are frequently connected to municipal sewerage systems, the average discharge for the municipality, expressed as population equivalent, is usually greater than the sewered population. For this reason the population equivalent of the mixed wastes from all municipalities is approximately 227,000 before treatment, while the sewered population is only 186,930. Therefore, on the basis of oxygen demand in the receiving waters, the industrial wastes comprise about 17 percent of the total pollutional load of municipalities.

Of the 57 industrial plants that have their own disposal facilities 31 discharge wastes of an inorganic nature. These 31 plants include 23 ore concentration mills, 5 primary metal plants, one chemical plant, and 2 sand and gravel plants. As the effect of wastes from these plants upon receiving bodies of water is variable, no common means of measuring the total pollutional load is applicable. Some of the wastes may only cause high turbidity in the water, while others may be toxic to humans, animals, fish and other aquatic life. Facilities installed at several of the plants for impounding ore treating wastes have helped to reduce the total pollutional impact on the basin's watercourses from these sources.

During the greater part of the year most streams with the exception of Coeur d'Alene River run clear, but at times, particularly during the spring run-off, some carry large quantities of silt and erosional debris. This condition is especially noticeable on Latah Creek, which drains the Palouse soils in the southwestern part of the watershed.

Additional surveys are needed to obtain a clear understanding of the entire pollutional problem and to establish a well-founded abatement program. Surveys of the area should be so planned that all major sources of wastes may be discovered and their nature and amounts evaluated.

DAMAGES TO WATER RESOURCES FROM POLLUTION

Pollution has been responsible for one large river in the basin becoming unfit for most water uses and has retarded developments, created nuisance conditions, and decreased property values along another.[1] The South Fork of Coeur d'Alene River below Mullan, Idaho, and the Coeur d'Alene River from the mouth of South Fork to Coeur d'Alene Lake is polluted with mining wastes. Its natural recovery would be doubtful even with complete removal of the objectionable wastes. Below Spokane, Washington, valuable recreational sites along the Spokane River and adjacent to Franklin D. Roosevelt Lake await development because of the polluted river water. Nuisance conditions have been created and property values decreased along stretches of this river.

Various aspects of the damages to water resources from pollution are discussed in detail below.

Public Health

Water pollution is generally recognized as a hazard, actual or potential, to health both of humans and domestic animals. In the Spokane River Basin both actual and potential health hazards exist.

During high water in the Spokane River, Spokane city wells are contaminated by river water seeping into the water table. Although this pollution is not excessive, it is and has been of concern to city officials. The normal water level in the city wells is higher than the water level in the river, but during high water in the river the reverse is true. The City of Spokane has recently constructed new pumping plants locating them far enough from the river to avoid contamination, and has introduced chlorination as a precautionary measure to safeguard the health of the people. Plate No. 1 of the Appendix shows the coliform content of well waters at the up river station during high water in the river in 1939.

Occasional bathing and fishing in Spokane River waters below the City of Spokane are definitely a health hazard. An example of how pollution can affect public health occurred in the form of a typhoid epidemic in Spokane in 1939. The investigation of the epidemic traced the outbreak to a certain dairy. According to local health authorities, the dairy employee who was the original source of the outbreak had contracted typhoid while swimming in the Spokane River. Samples collected from the river below Spokane in August, 1950, indicated a coliform content of 69,000 per 100 ml.

Spokane County has a higher enteric disease rate than prevails throughout the State as a whole. The 1937-42 six-year average death rate from all enteric diseases in Spokane County and for the State of Washington as a whole is shown on Plate 2.

1/ See Present Stream Status (Map No. 3).

Coeur d'Alene, Idaho, and the small community of Harrison obtain water for drinking purposes from Coeur d'Alene Lake. This water is disinfected by chlorination before use and is of satisfactory sanitary quality. It has been determined, however, that lead poisoning is a potential hazard in drinking waters where lead concentrations are greater than 0.1 part per million (p.p.m.). This is the maximum concentration allowed in waters used in interstate transport by Public Health Service standards. These standards have also been adopted by the Idaho Department of Public Health. Tests made in 1931 of raw water at the lake intakes of the Coeur d'Alene and Harrison water supplies by the Idaho Department of Public Welfare and the Public Health Service showed concentration of lead ranging from 0.05 to 2.25 parts per million. The average lead contents found were: At Coeur d'Alene intake 0.15 p.p.m. by the State and 0.22 p.p.m. by the Public Health Service; and at Harrison intake 0.26 p.p.m. by the State and 0.36 p.p.m. by the Public Health Service. These results were obtained from duplicate samples collected at the same time. Monthly tests since 1934 by the Idaho State Department of Public Health on samples submitted by the Washington Water Power Company indicate a range of lead concentrations in the Coeur d'Alene water distribution system of from less than .005 p.p.m. to .086 p.p.m. (See Appendix--Table 8.) These tests give results below the State and Public Health Service standards.

There are several reasons for the difference between the 1931 and later tests. These are as follows: (1) Dredging operations carried out since that time by mining interests in the Coeur d'Alene district have undoubtedly had some effect; (2) milling processes have also undergone marked changes since that time; and (3) there is evidence to indicate that the presence of copper in the samples analyzed at that time for lead interferred with the lead determinations giving high results. Although the monthly tests made by the Idaho Department of Public Health indicate a satisfactory quality of water at the Coeur d'Alene intake, it is believed that additional and more thorough surveys should be made of both the river and lake waters. These surveys should include both bottom and water sampling.

Domestic and Industrial Water Supply

Known damages to public water supplies as they affect public health have been discussed previously. Other damages are limited to the occasional silt loads carried during floods. Industries, in a number of cases, are required to provide more extensive treatment than is required by communities; however, this is attributed more to the chemical composition of the water than to organic pollution. Coeur d'Alene River water below the ore concentration mills is fit only for use in mining operations.

Agriculture

In 1930, landowners along the Coeur d'Alene River entered suit against the mine operators claiming damages to livestock and crops. They contended that these mine wastes were of a highly toxic nature and were injurious to vegetation as well as fish and animal life.

As a result of this litigation, the mine owners procured easements which were to be in payment of damage for the loss of crops and domestic animals. No figures are available as to the amount of damages paid upon settlement of the suit. Since 1931 when the suit was settled, mining interests have purchased most of the affected lands.

Hydroelectric Power

Principal damages from pollution in connection with hydroelectric power plants have been below Spokane, Washington, where floating scums and other sewage waste products have interfered with the operation of gates and dams.

Fish and Wildlife

All fish life has been destroyed in the South Fork of Coeur d'Alene River below Mullan, Idaho. In July, 1932, this stretch of river from shortly above Wallace, Idaho, was found to be practically devoid of fish, bottom fauna, or plankton organisms.[1] The effect of mining wastes on fishlife in Coeur d'Alene Lake has not been determined.

Wastes from the pulp mill at Millwood above Spokane have destroyed many bottom organisms downstream to the City of Spokane power dam. Fishing in this stretch of river has been seriously damaged.

Sludge deposits have been reported in Nine Mile Reservoir below Spokane and the formation of gas during periods of low flow indicates septic decomposition in this area. It is reported that fishing in the backwater of Nine Mile Dam is poor.

Recreation

Most extensive damages to recreation have occurred along the Spokane River below Spokane, Washington. On the shores of Long Lake and at the mouth of the river in the proposed Franklin D. Roosevelt Lake recreational area, recreational developments await abatement of pollution in the river. Many property owners at Long Lake have indicated a desire to build cabins or summer homes in this area. Planned developments by the National Park Service near the mouth of Spokane River likewise await the abatement of pollution in the river. Floating scums and slicks make these waters unattractive for bathing and other recreational uses during summer months.

Trees, logs, and mine tailings washed downstream during floods in the South Fork of Coeur d'Alene River have destroyed most of the recreational value of the lower Coeur d'Alene River.

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[1] Report of M. M. Ellis, Ph.D., Sc.D., In charge Interior Fishery Investigations, United States Bureau of Fisheries.

Property

In a number of locations, both along the Coeur d'Alene River and along the Spokane River below Spokane, Washington, property has been damaged by pollution. The valleys of the Coeur d'Alene and South Fork Rivers upstream from Cataldo Mission consist of vast irregular stretches of waste rock from valley side to valley side; mine tailings fill the entire valley floor in many places; and dead trees and stumps, resulting from fires, floods, and air and water pollution, are common in the valleys and along the banks. Below Cataldo mine owners have purchased farmland and purchased easements to farmlands to offset claims for damages caused by the deposition of mine wastes during floods on property adjacent to the Coeur d'Alene River. In addition, mine owners of the Coeur d'Alene mining district have spent over $750,000 since 1932 for dredging operations at Cataldo Mission Flats to protect water users in the Coeur d'Alene Lake area. An average of about one million cubic yards of tailings have been dredged from the river annually since 1932.

Aesthetic Aspect

With the exception of damages to public health, probably the greatest damage of all to any community through the pollution of its water resources is the loss of civic and personal pride and enjoyment. It should not be any more necessary to justify a water pollution abatement program than to justify a housewife cleaning her home or a community cleaning its streets and alleys.

It is difficult to measure in money value the effect of pollution from an aesthetic standpoint. To place a dollar value on conservation of our water resources as related to civic pride and pleasure is probably outside the realm of possibility.

BENEFITS RESULTING FROM POLLUTION PREVENTION AND ABATEMENT

The people of Coeur d'Alene, Idaho, and those living in the vicinity have derived a substantial monetary benefit from the abatement of pollution. Prior to the construction of a sewage treatment plant with an outfall into the Spokane River below the outlet of the lake, one sewer emptied above the outlet and adjacent to a desirable swimming beach. The beach waters above the lake outlet were contaminated and the shores defiled with floating sewage solids. Three saw mills located downstream frequently complained of offensive materials on logs. Sewage solids and odors made log handling an offensive and hazardous task. It was necessary to abandon a youth camp because of polluted water flowing past its recreational area. One downstream community threatened legal action. It cost the City of Coeur d'Alene about $140,000 to correct these conditions. The area around Coeur d'Alene Lake is a recreational center of great importance and many fine bathing beaches and recreational areas have been developed and opened for public use. The tourist trade, attracted by the fine facilities located at Coeur d'Alene and the beautiful surroundings, accounts for a major portion of the basin's 20 million dollar annual income from out-of-State visitors. The youth camp has been reestablished with an assurance of protection from pollution. Saw mills no longer complain of damaging effects from Coeur d'Alene's sewage.

Abatement of pollution at Coeur d'Alene, Idaho,has eliminated a potential health hazard in the Post Falls irrigation project which obtains its water supply from the Spokane River. The water now obtained from the Spokane River, although below the present outlet from the Coeur d'Alene treatment plant, is considered safe for use as a source of irrigation water. Prior to construction of the treatment plant at Coeur d'Alene this water was heavily polluted. The proposed Rathdrum Prairie Project of the Bureau of Reclamation may pump additional water from the Spokane River for irrigation.

During the war large industrial plants and military installations such as the Naval Depot and various air bases were constructed in the vicinity of Spokane. Through diligent efforts of local, State, and Federal Public Health officials these plants were required to use the best known methods for disposal of chemical and other industrial type wastes and to provide treatment for domestic sewage. This foresight undoubtedly saved the City of Spokane ground water supply from becoming heavily polluted since one of the plants and a military installation were located on the Spokane River above Spokane. The cost of constructing waste treatment facilities at the aluminum reduction mill, aluminum rolling mill, magnesium plant, and military bases, although only a minor part of the total cost of all construction, was probably as much as the cost of treatment facilities installed prior to the war by all of the communities and industries located in the basin.

Because of a lack of continuing surveys, it is difficult to place a monetary or other value on the benefits derived from dredging operations at Cataldo Mission Flats since 1932. Slightly more than $750,000 has been spent on dredging operations. Individual mining companies have constructed tailing ponds and others are spending considerable sums of money in keeping mine wastes from entering the river. The total amount of money spent by mining interests to protect downstream water users undoubtedly amounts to several millions of dollars. While a visual inspection of the river does not indicate improvements in the contents, there is a marked reduction in the degradations along the river banks. Deepening of the river channel through the dredging operations and straightening the channel by the mining companies and local and Federal agencies have assisted greatly in these improvements. Unfortunately, information is not available to indicate the present quality of water in Coeur d'Alene River. From monthly analyses of water samples taken at the municipal water plant of Coeur d'Alene between January 1934 and March 1950 (See Appendix--Table 8), a reduction in the lead content of the lake water is noted. In 1934 the average lead content was found to be .0248 p.p.m. as compared with an average of .005 p.p.m. in 1949. These analyses indicate a marked improvement in the quality of water in Coeur d'Alene Lake, particularly since the beginning of dredging operations in 1932 when the lead content at the water supply intake (Coeur d'Alene) was found to be .15 p.p.m. by the Idaho Department of Welfare and .22 p.p.m. by the Public Health Service. The greatest benefits, of course, have been realized by the mine owners themselves.

Whether or not the measures undertaken by mining interests in the Coeur d'Alene area are adequate to protect the lake and Spokane River can be determined only by additional investigations. It is believed that these measures have done little to improve conditions in the Coeur d'Alene River. It appears to be neither practical nor economical at this time to attempt to restore this river to its original condition. The immediate concern of both the mine owners and the people residing in the basin is to make sure that the health of the people using Coeur d'Alene Lake water for drinking purposes is protected as well as the preservation of other water uses. In this connection a new process for the disposal of mine tailings by the Day Mines Company is worthy of mention. This process, called the "Sand Fill Process," is in use by this company in Nine Mile canyon north of Wallace, Idaho. In this process tailings are first settled in tanks with the overflow, containing up to 50 percent of the total solids, being discharged to the creek. The settled materials, about 50 percent of the total, are discharged to a thickener where sufficient fresh water is added to make them the proper consistency to flow through pipes back into the mine. The mine stope is made water-tight prior to filling. The finely ground mine tailings when discharged into the stopes solidify quickly. It appears that this method will have very limited application in the Coeur d'Alene mining district. It is also obvious that use of the sand filled process will eliminate only a small portion of the total waste entering the river.

All of these pollution prevention measures have had a beneficial effect upon the general health, welfare, and security of the people residing within the basin. Specific measures have led to improved sanitary conditions with direct benefits to local and downstream populations.

The abatement of pollution in surface waters of the Spokane River Basin will provide many additional benefits. In Idaho where most of the communities are dependent upon surface sources for domestic water supplies the control of bacterial pollution is necessary to permit continued use of these waters without costly treatment. Most diligent care will need to be exercised in fringe areas around lakes to avoid human contamination of the waters which are now used for domestic purposes. The rapidly increasing recreational use of lake waters makes the installation of facilities,for proper disposal of all human wastes, imperative if use of such waters for domestic and recreational purposes is to be continued.

Treatment of wastes from the Inland Empire Paper Mill at Millwood and of sewage and industrial wastes at Spokane will permit the development of recreational areas and homes along the lower river stretches and adjacent to Franklin D. Roosevelt Reservoir. In addition, it will provide suitable waters for planting and propagating fish. Spokane will need additional recreational resources to take care of its rapidly growing population. The many attractions which will be brought about through pollution abatement will assist in maintaining and expanding the basin's important tourist trade.

Development of the Columbia Basin Irrigation Project is bringing many people to live in that area adjacent to the Spokane Basin. Spokane, the largest nearby city, will be amply repaid for monies expended in abatement of pollution so that additional recreational attractions may be developed.

POLLUTION PREVENTIVE MEASURES IN EFFECT

The States of Idaho and Washington have taken measures toward abatement of pollution in the Spokane River Basin. In 1931, the State Legislature of Idaho created the Coeur d'Alene River and Lake Commission to study and recommend means of eliminating from the Coeur d'Alene River and Coeur d'Alene Lake, so far as practicable, all industrial wastes which pollute or tend to pollute their waters and to determine and recommend methods of preventing pollution detrimental to vegetation and domestic crops; to public health or the health of animals, fish or aquatic life, or detrimental to the use of waters for recreational purposes.

Based upon reports submitted by the various cooperating agencies, upon hearings conducted by the Commission, and upon the observations of its members, the commission made the following recommendation in December 1932: (1) that the use of the dredge may be very effective in cleaning the deposits of slime out of the Coeur d'Alene River and reclaiming that portion of the river below Cataldo and (2) that the most efficient methods of handling the slimes which come from the mills is to transport them to the settling beds by some method other than by using the river channel.

During these investigations the mine operators started dredging operations at Cataldo Mission Flats on the Coeur d'Alene River and have continued these dredgings since that time. Four mills have installed and are using tailing ponds, and one mill deposits a portion of its tailings back into the mine. The river below Cataldo has not been reclaimed and a major portion of the tailings are still being transported from the mills to settling beds by use of the river channel.

In December 1935, the Washington State Director of Health issued an official notice to the City of Spokane that discharge of raw sewage constituted a nuisance and menace to public health and notified the city that within 90 days they were to start proceedings to abate said nuisance and to have completed the abatement within 365 days. Subsequent to this notice the city officials of Spokane took the necessary actions and held several elections for the purpose of authorizing expenditures of funds for interceptor sewers and a sewage treatment plant. The people failed to vote the necessary funds at these elections. In 1941 the Washington State Legislature passed an act prohibiting all cities of over 100,000 population not located on tidewaters from discharging sewage into waters used for domestic purposes and empowered the State Director of Health to order such cities to construct and operate sewage disposal systems if an investigation by the Director revealed the necessity of a plant. The City of Spokane in 1946 approved an issue of $1,700,000 general obligation bonds. An allotment of $1,050,700 from the State Development Board was also received at about this time, and $1,000,000 was available from accumulated surpluses of the City. With these funds available the city has started construction on the project originally estimated to cost

$3,500,000. Costs have increased since the war and additional funds are now needed to complete this project.

These actions by the States do not include all their efforts toward pollution prevention and abatement. Adequate legislation for the control of water pollution has been in effect in Washington since 1945. The Idaho State Legislature in 1949 passed a joint resolution (H.J.R. No. 9) proposing an amendment to the constitution allowing cities and villages to issue revenue bonds for construction of sewage treatment plants. This amendment was voted on by the people at the general election of November 1950 and passed by a large majority. In addition, during 1949 the Governor of Idaho appointed an advisory committee to work with the State Department of Health on matters pertaining to stream pollution.

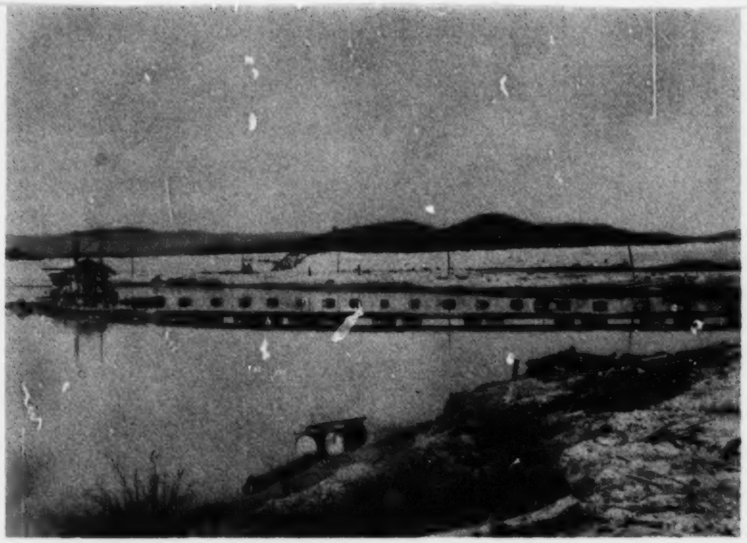
In the State of Washington, laws are adequate for financing sewage treatment plants through both revenue and general obligation bonds, and a number of communities in the Spokane Basin are setting aside sewer rental fees to pay for this type of construction.

In 1949, pollution control agencies in both Idaho and Washington adopted minimum requirements for industrial waste prevention and treatment. In Washington pollution control laws are adequate for enforcement of these regulations and progress is being made toward compliance with them by all industries of the basin. Existing pollution control laws of Idaho do not provide for the enforcement of regulations in connection with the disposal of all industrial wastes. The compliance with these minimum requirements in Idaho will necessarily have to be on a cooperative basis.

The treatment and waste prevention facilities already constructed in the basin have resulted primarily from these actions by the States and the persuasive efforts of the State pollution control agencies working with individual communities and industries. In some instances civic pride and a realization of the improved conditions which would create an actual monetary benefit to the community or industry have been instrumental in causing the abatement of pollution.

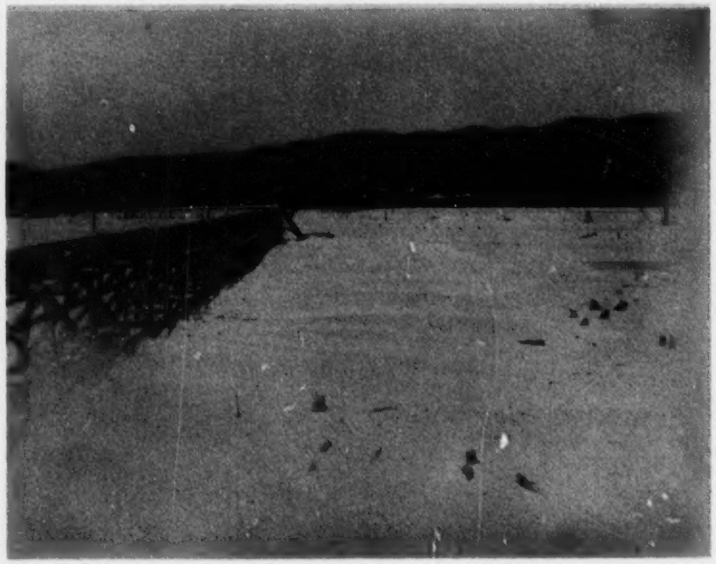
In the Spokane River Basin there are 14 municipal sewer systems serving a population of 186,930 and four systems serving military establishments. Four municipalities without community sewers discharge raw sewage from 2,150 people through individual outfalls. Five existing municipal treatment plants serve a population of 15,000, or less than eight percent of the total sewered population, exclusive of the military establishments. Two of these latter have treatment facilities making a total of seven treatment plants in the basin. Of the five municipal treatment plants, one provides primary treatment and the remainder secondary treatment.

Of the 54 industrial establishments not connected to municipal sewers, but which discharge wastes directly to watercourses, 21 have

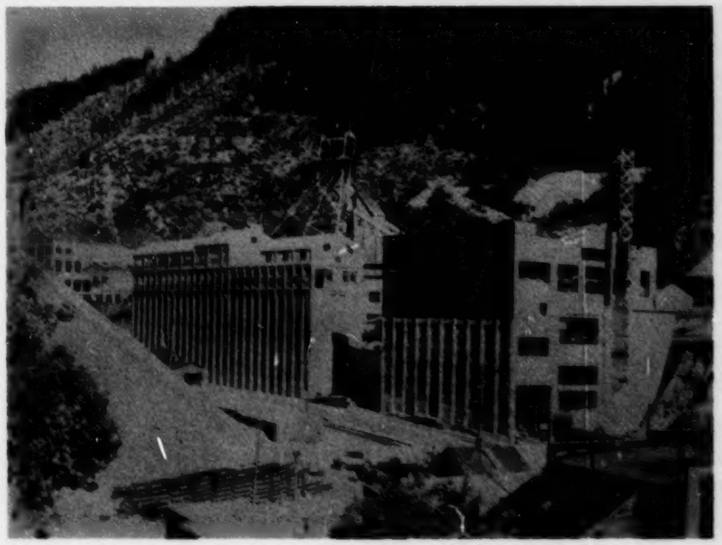


CATALDO DREDGE POND AT MISSION FLATS

TAILINGS IMPOUNDMENT IN VICINITY OF KELLOGG, IDAHO



IMPOUNDMENT FOR TAILINGS REMOVED FROM CATALDO DREDGE POND



ORE CONCENTRATION MILL AT BURKE ON CANYON CREEK STEEP TERRAIN NECESSITATED CONSTRUCTION OF CONDUIT BENEATH BUILDINGS THROUGH WHICH CREEK NOW FLOWS.

provided measures to abate pollution, 31 have no treatment facilities and facilities at two are undetermined.

The existing municipal and industrial treatment facilities are summarized in Tables C and D.

TABLE C

EXISTING TREATMENT FACILITIES

MUNICIPAL

Degree of Treatment Provided	Number Municipalities*	Number Plants	Population Served**
Primary	1	1	3,300
Secondary	6	6	11,700
None	11	0	171,930
TOTAL	18	7	186,930

* Includes incorporated or unincorporated municipalities, military establishments, and other population centers.

** Exclusive of military establishments.

TABLE D

EXISTING TREATMENT FACILITIES

INDUSTRIAL*

Type of Industry	No. of Plants	No. of Industrial Plants Having: Treatment Facilities	No Treatment Facilities	Undetermined Facilities
Food and Kindred Products:				
Meat Products	7	5	2	0
Milk Products	4	2	2	0
Canning and Preserving	3	3	0	0
Breweries	1	0	1	0
Grain Products	1	0	1	0
Lumber and Wood Products:	4	2	1	1
Pulp Mills	1	0	1	0
Chemicals and Allied Products	1	0	1	0
Laundries	2	0	2	0
Mining:				
Mining & Ore Concentration	23	4	18	1
Other Mining	2	0	2	0
Primary Metal Industries:				
Smelting and Refining Aluminum	1	1	0	0
Smelting and Refining Other Ores	3	3	0	0
Aluminum Rolling	1	1	0	0
TOTAL	54	21	31	2

* Industries having separate outlets discharging wastes directly to watercourse.

The fact that treatment facilities or waste prevention measures have been installed does not necessarily mean that those communities and industries are adequately treating the sewage or wastes entering the river. In the case of municipal treatment plants, too often it is found that unexpected population growths and industrial wastes have overloaded plants or that insufficient attention is given to their operation.

Industries, likewise, may be lax in their operation of treatment facilities; but more often it is found that facilities are provided only for partial treatment or recovery of only a small portion of their total wastes. Information on the adequacy of existing treatment facilities is shown in Tables E and F.

TABLE E

ADEQUACY OF EXISTING TREATMENT FACILITIES

MUNICIPAL*

Number of municipal* treatment plants	Adequacy with relation to:					
	Capacity			Operation		
	Satisfactory	Unsat.	Undeterm.	Satisfactory	Unsat.	Undeterm.
7	6	1	0	7	0	0

* Includes incorporated and unincorporated municipalities, military establishments, and other population centers.

TABLE F

ADEQUACY OF EXISTING TREATMENT FACILITIES

INDUSTRIAL*

Number of industrial treatment facilities	Adequacy with relation to:					
	Capacity			Operation		
	Satisfactory	Unsat.	Undeterm.	Satisfactory	Unsat.	Undeterm.
21	13	2	6	14	1	6

* Industries having separate outlets discharging directly to watercourse.

Not included in the above group of treatment facilities is the dredge operated by mine owners at Cataldo Mission Flats on the Coeur d'Alene River. This dredge is in operation during about six months of the year depositing the tailings it pumps from the river on adjacent lands. The Coeur d'Alene River at Cataldo Flats forms a natural settling basin about 26 miles above Coeur d'Alene Lake. At times backwater from the lake extends above the basin. Excepting during high water and flood periods most of the mill tailings carried downstream by the Coeur d'Alene River are deposited in this natural basin.

Available information indicates that only three treatment plants have been installed in the basin since World War II. These are the Deer Park, Tekoa, and Fairfield, Washington, sewage treatment plants, which were completed during 1951. Since 1948 the City of Spokane has had under construction interceptor sewers. Upon completion of the interceptors a treatment plant will be constructed and the sewage and most of the industrial wastes originating in Spokane treated prior to discharge.

Two soil conservation districts are operating in the basin. With technical assistance provided by the Soil Conservation Service of the Department of Agriculture, these districts have underway a program of soil and moisture conservation which will be very helpful in reducing the silt load from these areas. The activities of these districts are an important part of any pollution abatement program for the Spokane Basin.

POLLUTION PREVENTION MEASURES REQUIRED

Specific requirements to accomplish these results and to eliminate other local pollutional hazards can be indicated only in the case of municipalities. Further surveys are needed to fully indicate waste treatment requirements. This does not mean, however, that municipalities should not provide sewage treatment and industries should not take steps to reduce the amount of their wastes discharged to streams. Known waste prevention and recovery measures applicable to many types of plants should be employed wherever possible. Milk products, meat packing, cannery, brewery, and forest products plants are in this category. The pulp and paper mill near Spokane, Washington, at times discharges into the Spokane River wastes having an estimated population equivalent of 130,000. This has an oxygen depletion effect nearly as great as the domestic wastes of the City of Spokane. This industry should start planning the necessary facilities to eliminate its wastes from the Spokane River.

The steep slopes and narrow canyon-like valley of the South Fork of Coeur d'Alene River limit the use of tailing ponds. Even when these can be used, the danger of large deposits being washed downstream into Coeur d'Alene Lake is always present. It does not appear to be practical to attempt the reclamation of the river below Mullan, Idaho, as long as extensive mining continues in the area. A storage dam across the lower valley to retain silt or a combination flood control dam with storage provided for silt retention might be an adequate solution to the problem. Both the Corps of Engineers and Bureau of Reclamation have recommended construction of a large flood control, irrigation, and power dam on the Coeur d'Alene River. Such a project might at the same time be designed to serve as a pollution barrier for Coeur d'Alene Lake. However, because of the existence of the Osburn Fault in this area, it has been considered by mining interests as inadvisable to construct a large dam on the lower Coeur d'Alene River. Further surveys and studies are needed before any of these projects may be considered as a solution to the pollution problem in the Coeur d'Alene Lake.

The Idaho State Department of Public Health and the Washington State Pollution Control Commission have recommended an early action program of pollution abatement for the basin. The treatment plant requirements for this program are shown in Tables H and I.

TABLE H

WASTE TREATMENT NEEDS--MUNICIPAL*

Needs	Number	Population served by facilities
New Plant	9	171,930
Enlargement or addition to existing plant	1	3,300
Sewerage system and treatment plant	4	2,150
Connection to municipal sewer	2	Variable
No project required	6	11,700
Undetermined	0	0

* Includes incorporated or unincorporated municipalities, military establishments, and other population centers.

TABLE I

INDUSTRIAL* WASTE POLLUTION ABATEMENT NEEDS

Needs	Number
New treatment plant or other pollution control measures	6
Connection to municipal sewer	5
No project required	14
Undetermined	29

* Industries having separate outlets discharging wastes directly to watercourse.

The municipal program provides for the construction of new sewage treatment plants in nine locations and the addition of treatment facilities at one location. Four communities should construct community sewerage systems and treatment plants. In addition, two military establishments that now discharge raw sewage to the Spokane River will connect to the sewers of Spokane, Washington, upon completion of the city's treatment plant. The total cost of municipal construction for the basin is estimated at $4,500,000.

The City of Spokane requires interceptor sewers and a primary treatment plant. Contracts have been awarded for the construction of portions of the interceptor sewers and these are under construction. No action has been taken by the other 11 municipalities having project requirements. The current status of municipal action on pollution abatement needs is summarized in Table J.

TABLE J

CURRENT STATUS OF MUNICIPAL ACTION ON

POLLUTION ABATEMENT NEEDS

Status of Action	Number of Municipalities*
Inactive	15 ***
Under Construction	1 **

* Includes incorporated and unincorporated municipalities, military establishments, and other population centers.

** Interceptor sewers only under construction.

*** Includes two military establishments which have tentatively agreed to connect to the City of Spokane treatment plant when it is constructed, and 4 communities also needing sewerage systems.

Additional surveys are needed to determine the pollution abatement needs of 29 industrial establishments. Twenty-seven of these are located in Idaho and 2 in Washington. The present program for industrial waste pollution abatement, therefore, is limited to 25 establishments. Of these, six need new treatment plants or other pollution control measures and five require connection to the Spokane sewerage system. Fourteen industrial establishments need no projects. The total estimated cost of new construction is $350,000. One industry is now constructing facilities to connect with the Spokane municipal system, and two are actively planning the construction of pollution abatement facilities. The remaining eight establishments requiring new facilities are not actively planning their installation. The current status of industrial action on pollution abatement is summarized in Table K.

TABLE K

CURRENT STATUS OF INDUSTRIAL ACTION ON

POLLUTION ABATEMENT NEEDS

Status of Action	Number of Industries*
Inactive	8
Active Planning	2
Final Plans Approved	0
Under Construction	1
Undetermined	0

* Industries having separate outlets discharging wastes directly to watercourse.

Municipalities in the State of Washington may fix charges for sewer services and issue revenue bonds for construction of these sewerage facilities. When ordered by the State Director of Health, or if no general indebtedness is incurred, bonds may be issued and construction completed without a vote of the people. In other cases, a majority of the voters living in the community must pass any measure issuing revenue bonds.

Prior to November 1950 the constitution of the State of Idaho did not permit a municipality to issue revenue bonds for the construction of sewage treatment facilities and the limitations on issuance of general obligation bonds prohibited the financing of treatment plants by all except the larger communities. An amendment to the constitution to permit the issuance of revenue bonds for sewerage construction was voted upon by the people in the November 1950 election and carried by a large majority.

The municipalities and industries known to require improvements for abatement of pollution are listed in Table L.

TABLE L
MUNICIPALITIES AND INDUSTRIES NEEDING IMPROVEMENTS FOR ABATEMENT OF POLLUTION
JULY 1950

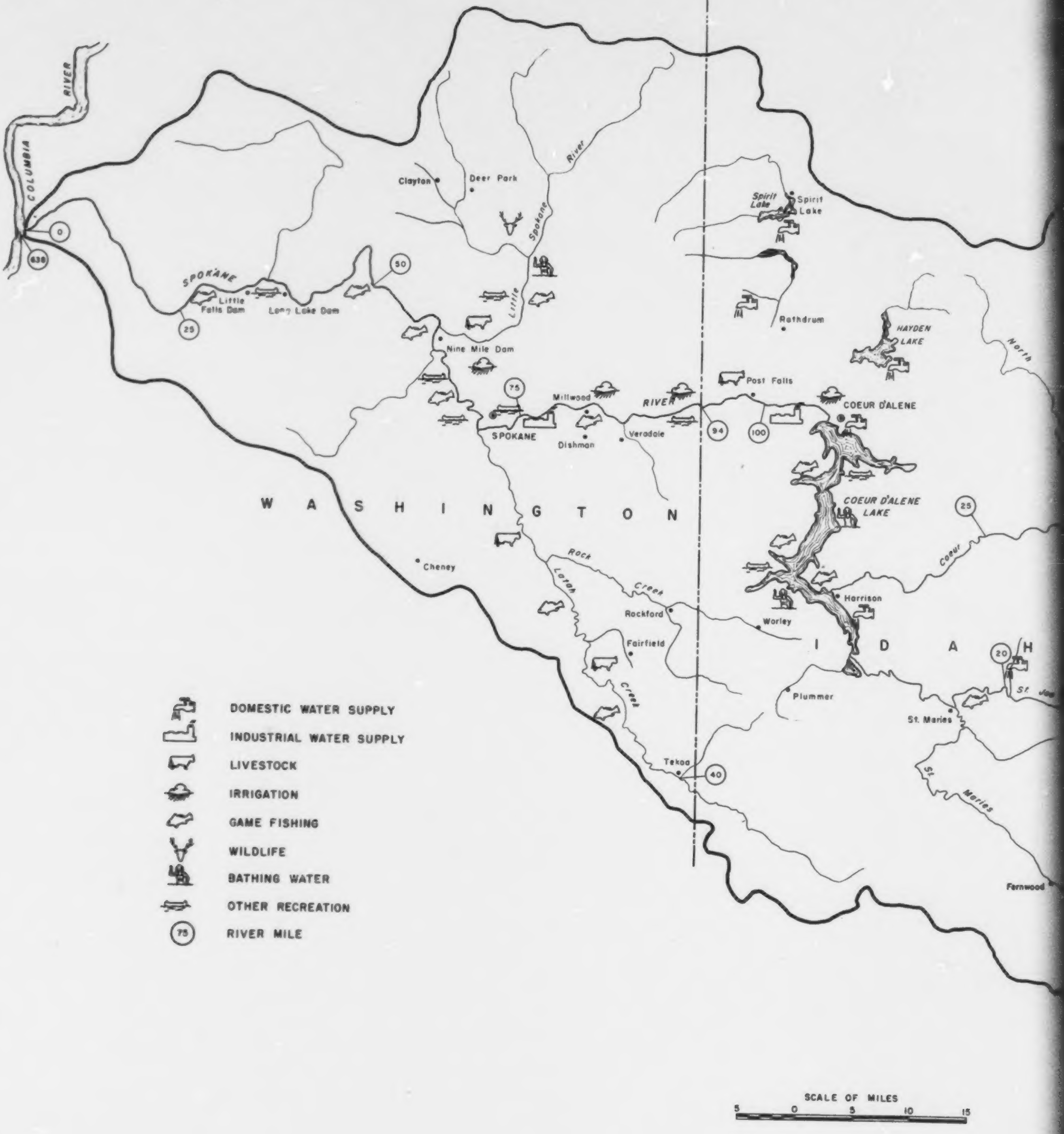
Name and Location	Population Served*	Improvements Needed	Remarks
IDAHO			
Avery	210	New plant	---
Harrison	40	New plant	---
Kellogg	4,100	New plant	---
Mullan	2,000	New plant	---
St. Maries	2,100	New plant	---
Wallace	3,100	New plant	---
Silverton	400	New plant	---
Wardner	750	Sewerage system and treatment plant	---
Burke	50	Sewerage system and treatment plant	---
Mace	400	Sewerage system and treatment plant	---
Gem	450	Sewerage system and treatment plant	---
Subtotal	14,100		
WASHINGTON			
Cheney	3,300	Additional treatment	---
Ft. George Wright	Variable	Connect to Spokane municipal system	---
Geiger Field	Variable	Connect to Spokane municipal system	---
Millwood	180	New plant	---
Inland Empire Paper Co.	130,000	New plant	---
Spokane	197,500	New plant	---
Acme Sand & Gravel Co.	-----	New plant	Turbid wastes
Armour & Co.	29,000	New plant	---
Crystal Laundry Co.	800	Connect to Spokane municipal system	---
Sicks' Spokane Brewery	12,000	Connect to Spokane municipal system	---
Spokane Flour Mills	1,000	Connect to Spokane municipal system	---
Spokane Toilet Supply Co.	1,200	Connect to Spokane municipal system	---

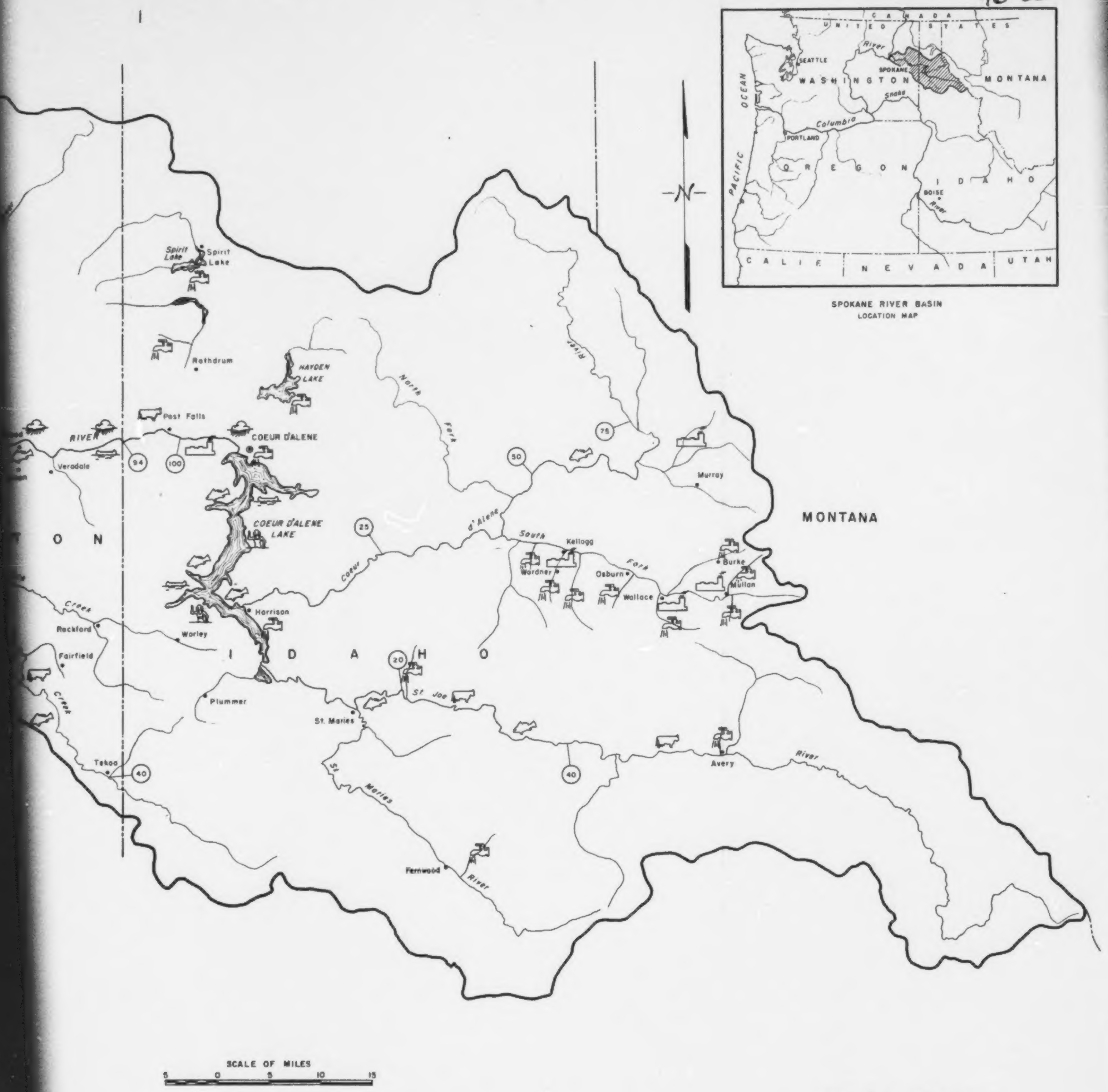
TABLE L (CONTINUED)

Name and Location	Population Served*	Improvements Needed	Remarks
WASHINGTON (Continued)			
Spokane (Cont.)			
Spokane Rendering Co.	Undetermined	New plant	---
Swift & Co.	10,000	New plant	---
Union Sand & Gravel	-----	New plant	---
United Creamery	190	Connect to Spokane municipal system	---
Subtotal	385,170		
TOTAL	399,270		

* For industries the organic waste load is expressed as population equivalent as measured by B.O.D. For municipalities the population equivalent of industrial wastes discharged to city sewers has been added to the population.

Adequate legislation for the control of water pollution is a recognized need in the State of Idaho. Existing laws provide the State Department of Health with inadequate means for controlling pollution from existing sources or enforcing the provision of treatment facilities in connection with construction of new plants. Municipalities and industries are not required to submit plans for waste treatment to this agency for approval prior to the start of construction. It has been a common practice, however, for municipalities and industries to seek the assistance and advice of the Public Health Department on matters pertaining to water pollution.


COLUMBIA
RIVER
0
636
SPOKANE
Little Falls Dam
Long Lake Dam
25
50
Clayton
Deer Park
Spokane
River
Little
Spirit Lake
Spirit Lake
Rathdrum
HAYDEN LAKE
North
Nine Mile Dam
75
Millwood
RIVER
Post Falls
COEUR D'ALENE
SPOKANE
Dishman
Veradale
94
100
COEUR D'ALENE LAKE
25
Coeur
W A S H I N G T O N
Cheney
Rock
Creek
Latah
Creek
Rockford
Fairfield
Worley
Harrison
I D A H
20
St. Joe
Plummer
St. Maries
St.
Maries
Tekoa
40
Fernwood
DOMESTIC WATER SUPPLY
INDUSTRIAL WATER SUPPLY
LIVESTOCK
IRRIGATION
GAME FISHING
WILDLIFE
BATHING WATER
OTHER RECREATION
75
RIVER MILE
SCALE OF MILES
5
0
5
10
15

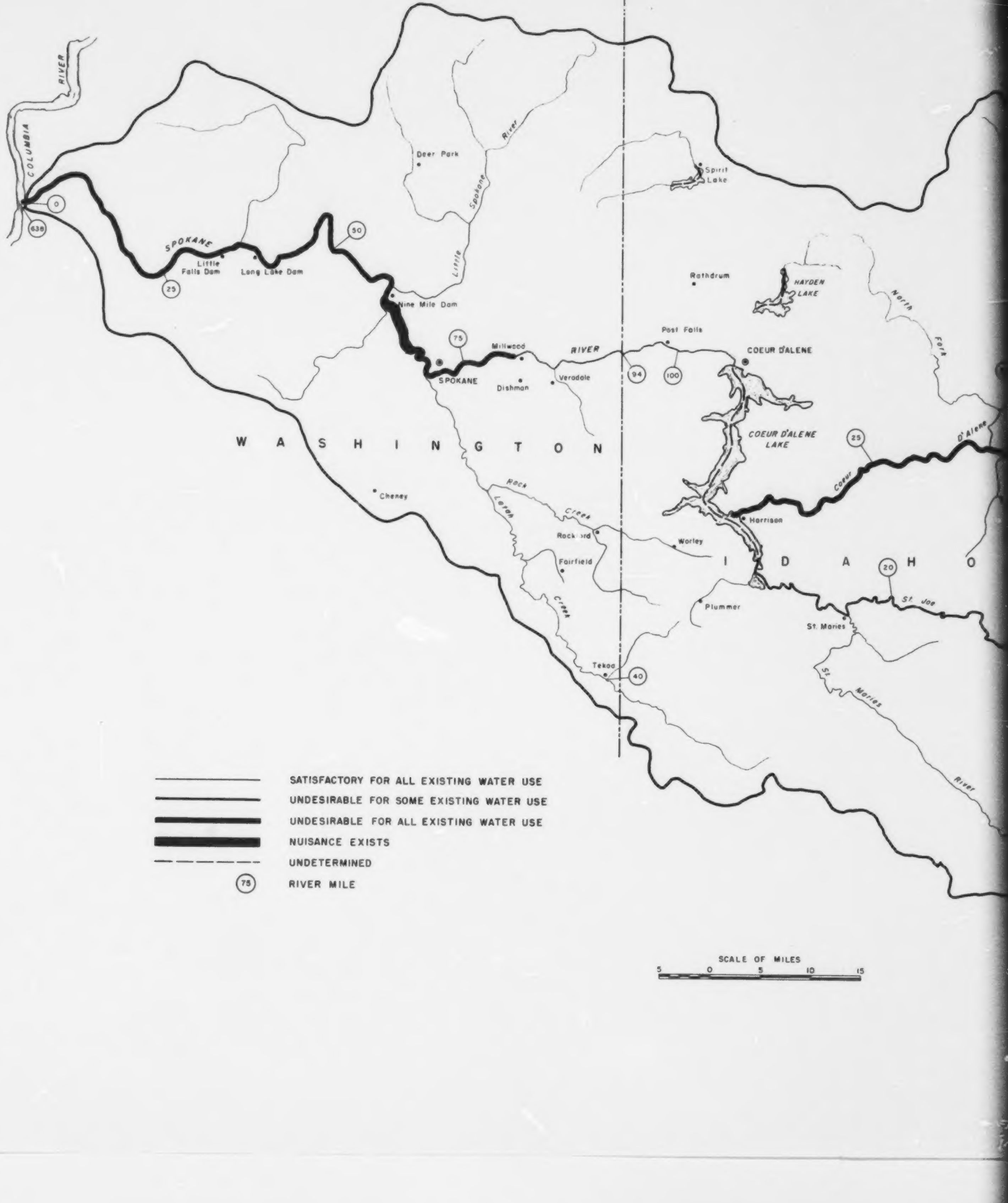

CANADA
UNITED STATES
SEATTLE
WASHINGTON
SPOKANE
River
Snake
Columbia
PORTLAND
MONTANA
PACIFIC OCEAN
OREGON
IDAHO
BOISE
River
CALIF
NEVADA
UTAH
SPOKANE RIVER BASIN
LOCATION MAP
N
Spirit Lake
Spirit Lake
Rathdrum
HAYDEN LAKE
Post Falls
COEUR D'ALENE
RIVER
Veradale
94
100
COEUR D'ALENE LAKE
TON
Creek
Rockford
Worley
Harrison
Fairfield
Creek
IDAHO
Plummer
St. Maries
Tekoa
40
20
St. Joe
River
Avery
40
St. Maries
River
Fernwood
25
Coeur
d'Alene
South
Fork
Kellogg
Wardner
Osburn
Wallace
Burke
Mullan
North
Fork
River
50
75
Murray
MONTANA
SCALE OF MILES
5
0
5
10
15

SPOKANE RIVER BASIN

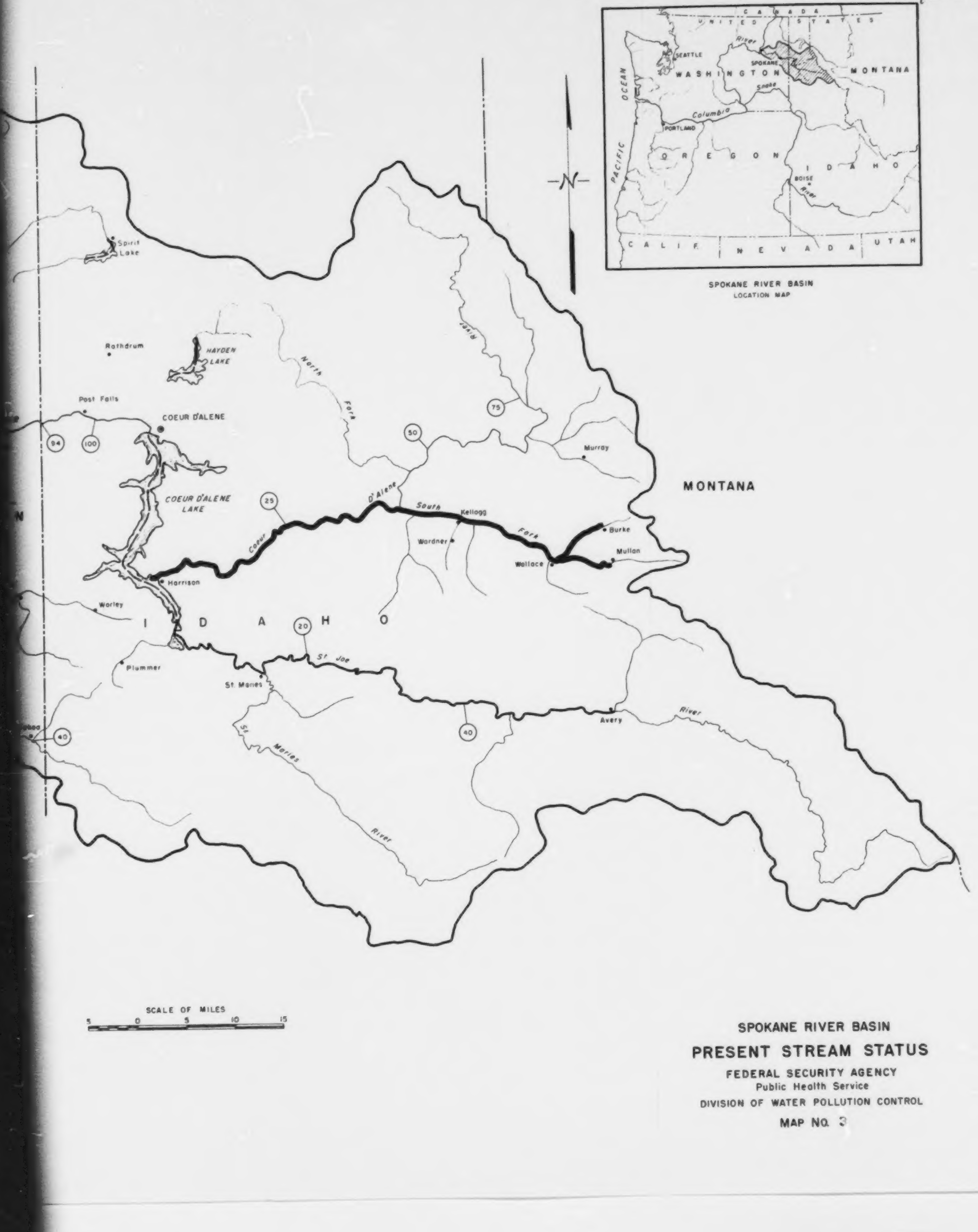
EXISTING PRIMARY WATER USES

FEDERAL SECURITY AGENCY
Public Health Service
DIVISION OF WATER POLLUTION CONTROL

MAP No. 2


COLUMBIA RIVER
0
638
SPOKANE
25
Little Falls Dam
Long Lake Dam
50
Nine Mile Dam
75
Millwood
RIVER
SPOKANE
Dishman
Veradale
94
100
Post Falls
COEUR D'ALENE
Deer Park
Spokane River
Little Spokane
Spirit Lake
Rathdrum
HAYDEN LAKE
North Fork
COEUR D'ALENE LAKE
25
Coeur D'Alene
Harrison
Worley
W A S H I N G T O N
I D A H O
Cheney
Rock Creek
Latah Creek
Rockford
Fairfield
Plummer
20
St. Joe
St. Maries
St. Maries River
Tekoa
40
SATISFACTORY FOR ALL EXISTING WATER USE
UNDESIRABLE FOR SOME EXISTING WATER USE
UNDESIRABLE FOR ALL EXISTING WATER USE
NUISANCE EXISTS
UNDETERMINED
75
RIVER MILE
SCALE OF MILES
5
0
5
10
15

46-br

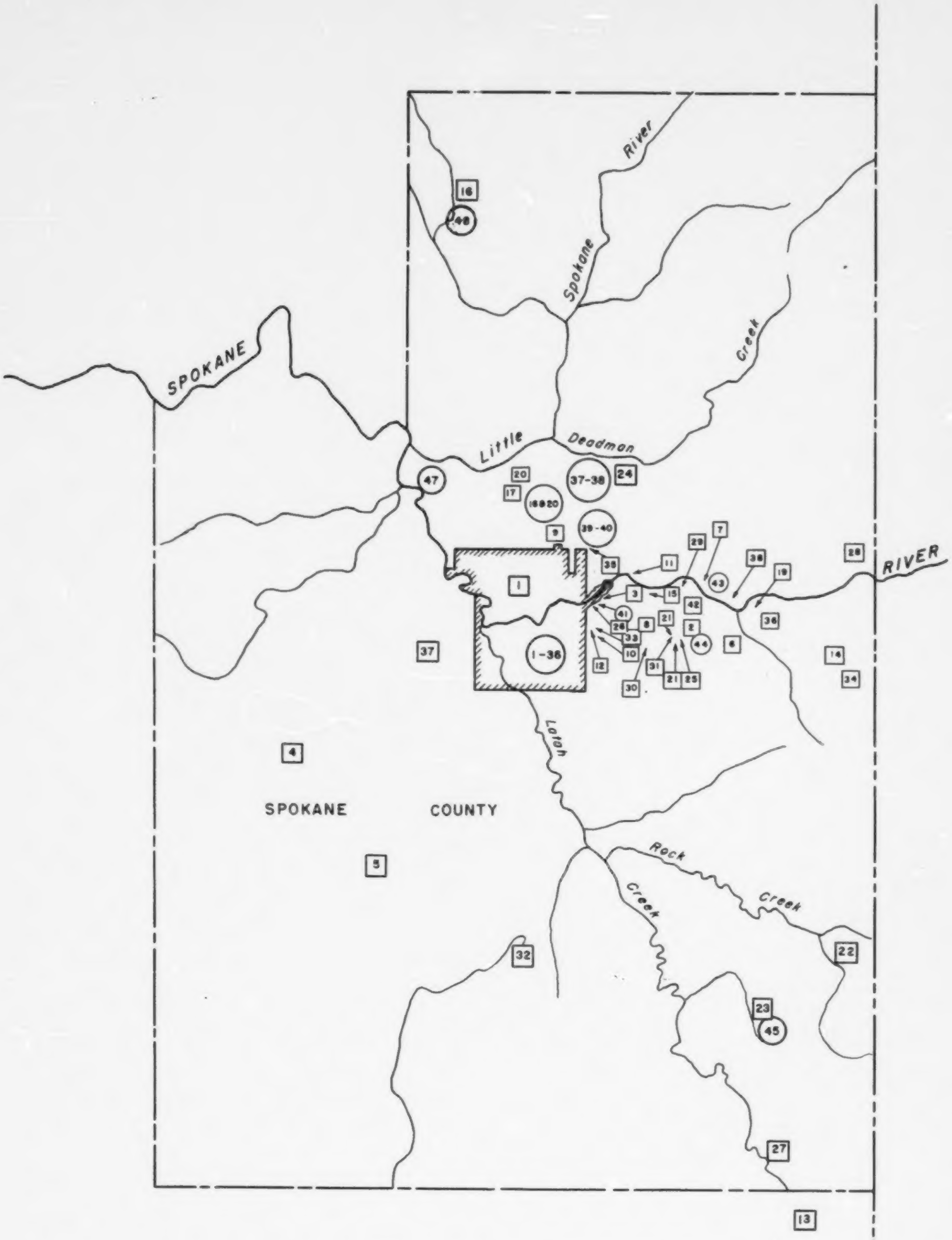

C A N A D A
U N I T E D S T A T E S
SEATTLE
River
SPOKANE
W A S H I N G T O N
M O N T A N A
OCEAN
Snake
Columbia
PORTLAND
PACIFIC
O R E G O N
I D A H O
BOISE
River
C A L I F.
N E V A D A
U T A H
SPOKANE RIVER BASIN
LOCATION MAP
N
Spirit Lake
Rathdrum
HAYDEN LAKE
North Fork
River
75
50
Post Falls
COEUR D'ALENE
94
100
Murray
MONTANA
COEUR D'ALENE LAKE
25
Coeur D'Alene South Fork
Kellogg
Wardner
Burke
Mullan
Wallace
Harrison
Worley
I D A H O
20
St Joe
Plummer
St. Maries
40
Avery
River
St Maries River
40
SCALE OF MILES
5 0 5 10 15

SPOKANE RIVER BASIN

PRESENT STREAM STATUS

FEDERAL SECURITY AGENCY
Public Health Service
DIVISION OF WATER POLLUTION CONTROL

MAP NO. 3


SPOKANE
RIVER
Spokane River
Little Deadman Creek
Latah
Rock Creek
Creek
SPOKANE COUNTY
16
46
47
20
17
18&20
37-38
24
9
39-40
1
35
11
29
7
43
38
19
28
RIVER
3
15
42
41
26
8
21
2
33
44
6
36
10
12
31
30
21
25
1-36
37
14
34
4
5
32
22
23
45
27
13

SPOKANE METROPOLITAN AREA

INDUSTRIAL WA

(6) INDUSTRY AND

	Spokane
1	WHITE PINE SAS
2	ARMOUR AND CO.
3	CARSTENS PACKI
4	BREWER LUMBER
5	GREAT NORTHER
6	GREAT NORTHER
7	EMPIRE COLD ST
8	BOHEMIAN BREW
9	LONG LAKE LUMB
10	OLD UNION STOC
11	SPOKANE BREWIN
12	BAIRD – NAUNDOR
13	E.G. OLSON LUM
14	SWIFT AND CO.
15	NATIONAL POLE
16	SPERRY FLOUR
17	CENTENNIAL FLO
18	DIAMOND MATCH
19	PIKE LUMBER CO.
20	DAVENPORT HOTE
21	SPOKANE RENDE
22	SPOKANE FLOUR
23	SPOKANE TOILET
24	HAZLEWOOD COLD
25	IDEAL LAUNDRY
26	INDUSTRIAL AIR
27	CASSIN ORNDORF
28	ACME SAND AND
29	TROY LAUNDRY CO
30	PARIS CLEANERS
31	UNION SAND AND
32	NEW METHOD LA
33	LUNDIN BROS. LA
34	AMERICAN LAUND
35	SICKS' SPOKANE
36	CRYSTAL LAUNDRY
	Mead
37	KAISER ALUMINUM
38	PACIFIC NORTHWE
	Hillyard
39	ADDISON MILLER
40	PHILIPS OIL REFI
	Yardley
41	ADDISON MILLER
	Millwood
42	INLAND EMPIRE P
	Trentwood
43	KAISER ALUMINUM
	Dishman
44	WASHINGTON BRICK
	Fairfield
45	UNION PACIFIC RAIL
	Vera
46	CHAS. M. RICE & S
	Nine Mile Falls
47	WASHINGTON WATER
	Deer Park
48	DEER PARK PINE

NOTE–

All Industries have
except as noted.

46-C

Creek
7
29
43
38
19
26
RIVER
42
2
44
36
14
34
25
Creek
22
23
45
27
13
EA

INDUSTRIAL WATER SUPPLIES

(6)	INDUSTRY AND LOCATION
	Spokane
1	WHITE PINE SASH CO.
2	ARMOUR AND CO.
3	CARSTENS PACKING CO.
4	BREWER LUMBER MILLS INC.
5	GREAT NORTHERN RAIL ROAD
6	GREAT NORTHERN ICE CO.
7	EMPIRE COLD STORAGE CO.
8	BOHEMIAN BREWERIES INC.
9	LONG LAKE LUMBER CO.
10	OLD UNION STOCKYARDS
11	SPOKANE BREWING & MALTING CO.
12	BAIRD-NAUNDORFF LUMBER CO.
13	E.G. OLSON LUMBER CO.
14	SWIFT AND CO.
15	NATIONAL POLE TREATING CO.
16	SPERRY FLOUR MILLS
17	CENTENNIAL FLOUR MILL
18	DIAMOND MATCH CO.
19	PIKE LUMBER CO.
20	DAVENPORT HOTEL
21	SPOKANE RENDERING CO.
22	SPOKANE FLOUR MILLS
23	SPOKANE TOILET SUPPLY CO.
24	HAZLEWOOD COLD STORAGE CO.
25	IDEAL LAUNDRY CO.
26	INDUSTRIAL AIR PRODUCTS CO.
27	CASSIN ORNDORF CO.
28	ACME SAND AND GRAVEL CO.
29	TROY LAUNDRY CO.
30	PARIS CLEANERS
31	UNION SAND AND GRAVEL (Surface)
32	NEW METHOD LAUNDRY
33	LUNDIN BROS. LAUNDRY
34	AMERICAN LAUNDRY
35	SICKS' SPOKANE BREWERY
36	CRYSTAL LAUNDRY CO. (Surface)
	Mead
37	KAISER ALUMINUM & CHEMICAL CORP.
38	PACIFIC NORTHWEST ALLOYS
	Hillyard
39	ADDISON MILLER ICE CO.
40	PHILIPS OIL REFINING CO.
	Yardley
41	ADDISON MILLER ICE CO.
	Millwood
42	INLAND EMPIRE PAPER CO.
	Trentwood
43	KAISER ALUMINUM & CHEMICAL CORP.
	Dishman
44	WASHINGTON BRICK & LIME CO.
	Fairfield
45	UNION PACIFIC RAIL ROAD
	Vera
46	CHAS. M. RICE & SON (MEAT)
	Nine Mile Falls
47	WASHINGTON WATER POWER CO.
	Deer Park
48	DEER PARK PINE INDUSTRIES

NOTE-
All Industries have ground water supplies, except as noted.

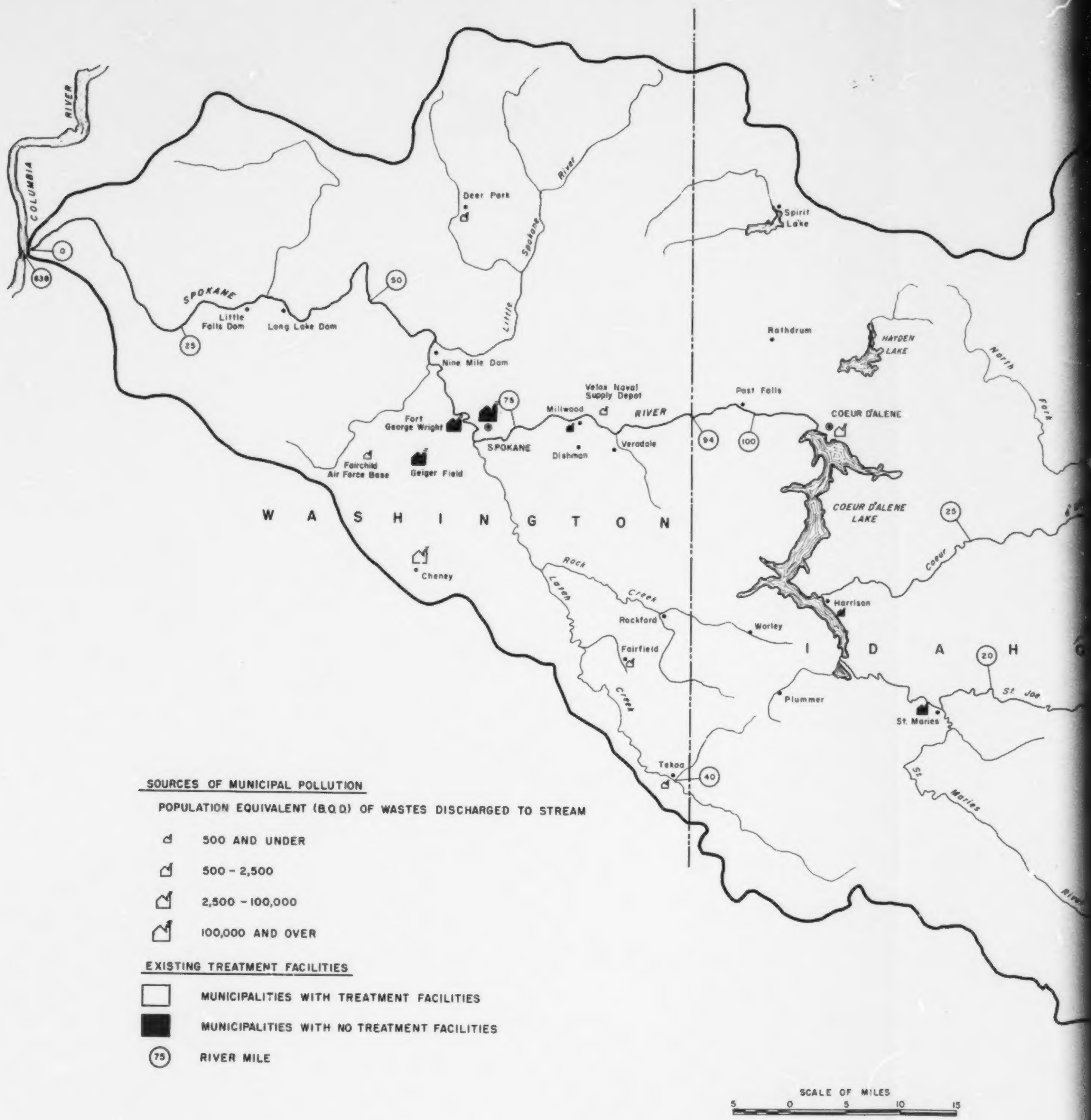
MUNICIPAL WATER SUPPLIES

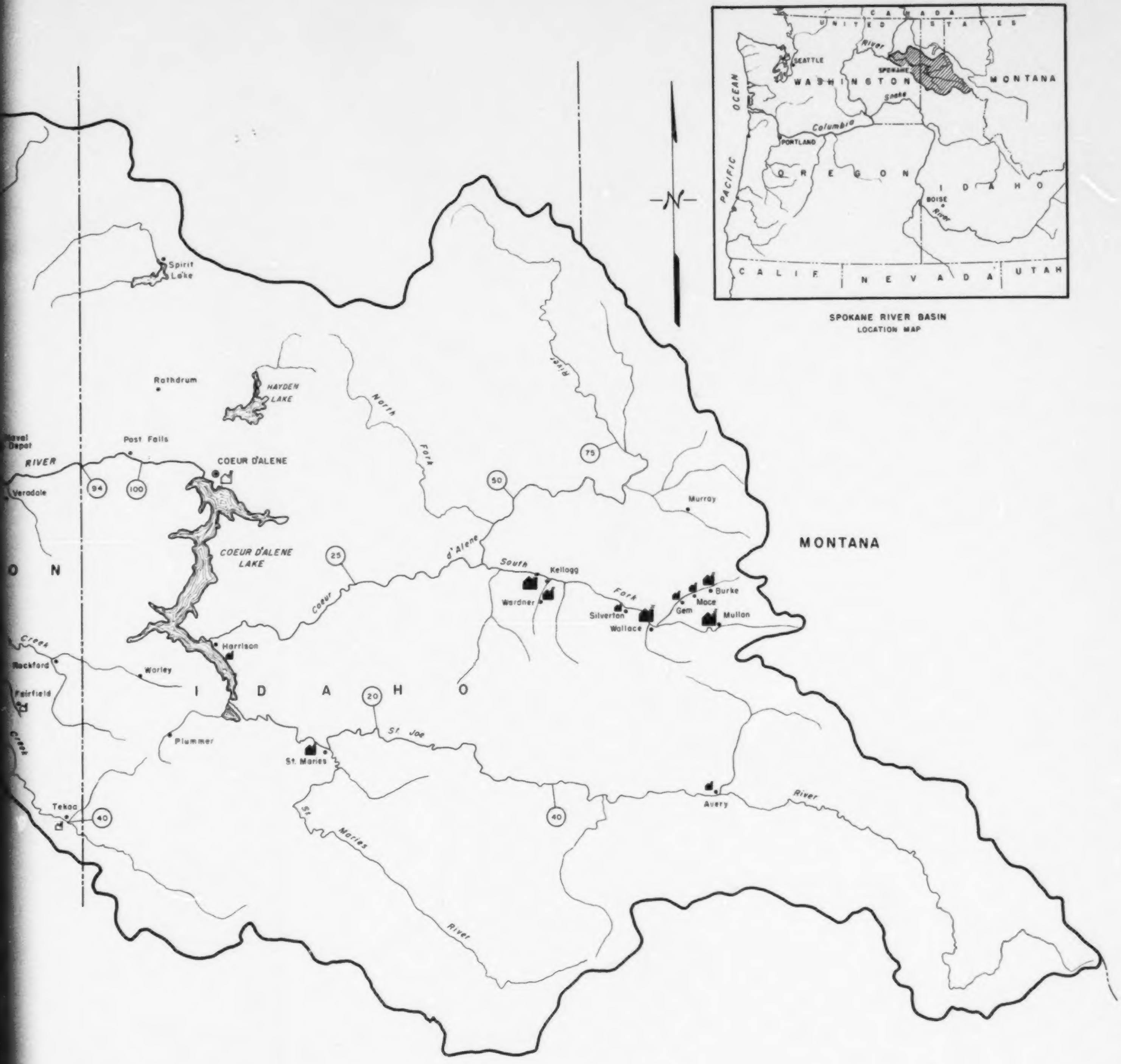
8	MUNICIPALITY	POPULATION SERVED
1	SPOKANE	168 000
2	MODERN ELECTRIC WATER CO.	8400
3	ORCHARD AVENUE W.D.	4200
4	MEDICAL LAKE	3015
5	CHENEY	2710
6	VERA I.D.	2650
7	TRENTWOOD I.D.	2250
8	HUTCHISON ADDITION CO.	2150
9	NORTH SPOKANE W.D. #8	1750
10	EAST SPOKANE W.D.	1700
11	PASADENA W.D.	1600
12	CARNHOPE I.D.	1400
13	TEKOA	1380
14	COMMUNITY W.D.	1350
15	MILLWOOD	1230
16	DEER PARK	1250
17	WHITWORTH W.D. #2	1200
18	MISCELLANEOUS SPOKANE VALLEY WATER DISTRICTS	1100
19	GREENACRES I.D.	850
20	WHITWORTH COLLEGE	850
21	UNIVERSITY PLACE W.D.	420
22	ROCKFORD	410
23	FAIRFIELD	400
24	MEAD	400
25	MODEL WATER & LIGHT CO.	380
26	YARDLEY W.D.	380
27	LATAH	325
28	EAST FARMS I.D.	300
29	IRVIN W.D.	300
30	EDGECLIFF SANATARIUM	290
31	DISHMAN W.D.	250
32	SPANGLE	245
33	EASTWOOD I.D.	200
34	LIBERTY LAKE UTILITY CO.	200
35	ST. MICHAELS SCHOLASTICATE	170
36	BACON TRACTS I.D.	140
37	ARMY, NAVY & AIR FORCE INSTALLATIONS	VARIABLE
38	VELOX NAVAL SUPPLY DEPOT	VARIABLE

NOTE-
All Municipalities have ground water supplies.

SPOKANE RIVER BASIN
MUNICIPAL
AND
INDUSTRIAL WATER SUPPLIES
SPOKANE METROPOLITAN AREA

FEDERAL SECURITY AGENCY
Public Health Service
DIVISION OF WATER POLLUTION CONTROL
MAP NO. 4


COLUMBIA
RIVER
0
638
SPOKANE
25
Little Falls Dam
Long Lake Dam
50
Deer Park
Little
Spokane
River
Nine Mile Dam
Spirit Lake
Rathdrum
HAYDEN LAKE
North
Fork
Velox Naval Supply Depot
Millwood
RIVER
75
Fort George Wright
SPOKANE
Dishman
Veradale
94
100
Post Falls
COEUR D'ALENE
Fairchild Air Force Base
Geiger Field
COEUR D'ALENE LAKE
25
Coeur
W A S H I N G T O N
Cheney
Rock
Latah
Creek
Rockford
Harrison
Worley
I D A H O
20
Fairfield
Creek
Plummer
St. Joe
St. Maries
St.
Maries
River
Tekoa
40
SOURCES OF MUNICIPAL POLLUTION
POPULATION EQUIVALENT (B.O.D.) OF WASTES DISCHARGED TO STREAM
500 AND UNDER
500 - 2,500
2,500 - 100,000
100,000 AND OVER
EXISTING TREATMENT FACILITIES
MUNICIPALITIES WITH TREATMENT FACILITIES
MUNICIPALITIES WITH NO TREATMENT FACILITIES
75
RIVER MILE
SCALE OF MILES
5
0
5
10
15

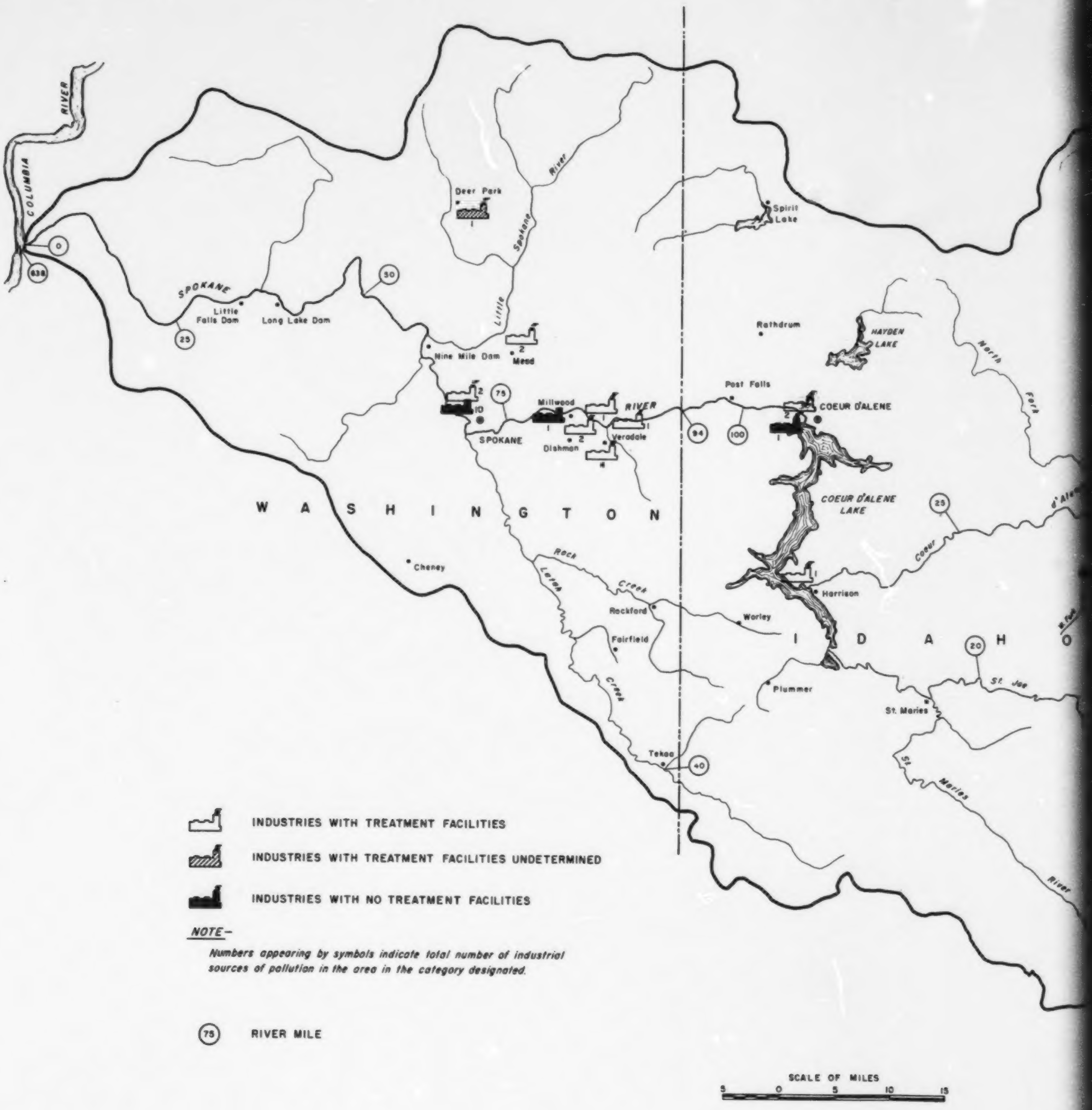

CANADA
UNITED STATES
River
SEATTLE
SPOKANE
WASHINGTON
MONTANA
PACIFIC OCEAN
Snake
Columbia
PORTLAND
OREGON
IDAHO
BOISE
River
CALIF.
NEVADA
UTAH
SPOKANE RIVER BASIN
LOCATION MAP
N
Spirit Lake
Rathdrum
HAYDEN LAKE
Naval Depot
Post Falls
RIVER
COEUR D'ALENE
Veradale
94
100
COEUR D'ALENE LAKE
ON
Creek
Rockford
Fairfield
Creek
Harrison
Worley
I D A H O
25
Coeur d'Alene
South Fork
Kellogg
Wardner
Silverton
Wallace
Gem
Mace
Burke
Mullan
Murray
MONTANA
50
75
North Fork
River
20
St. Joe
River
St. Maries
Plummer
Tekoa
40
40
Avery
St. Maries
River
SCALE OF MILES
5 0 5 10 15

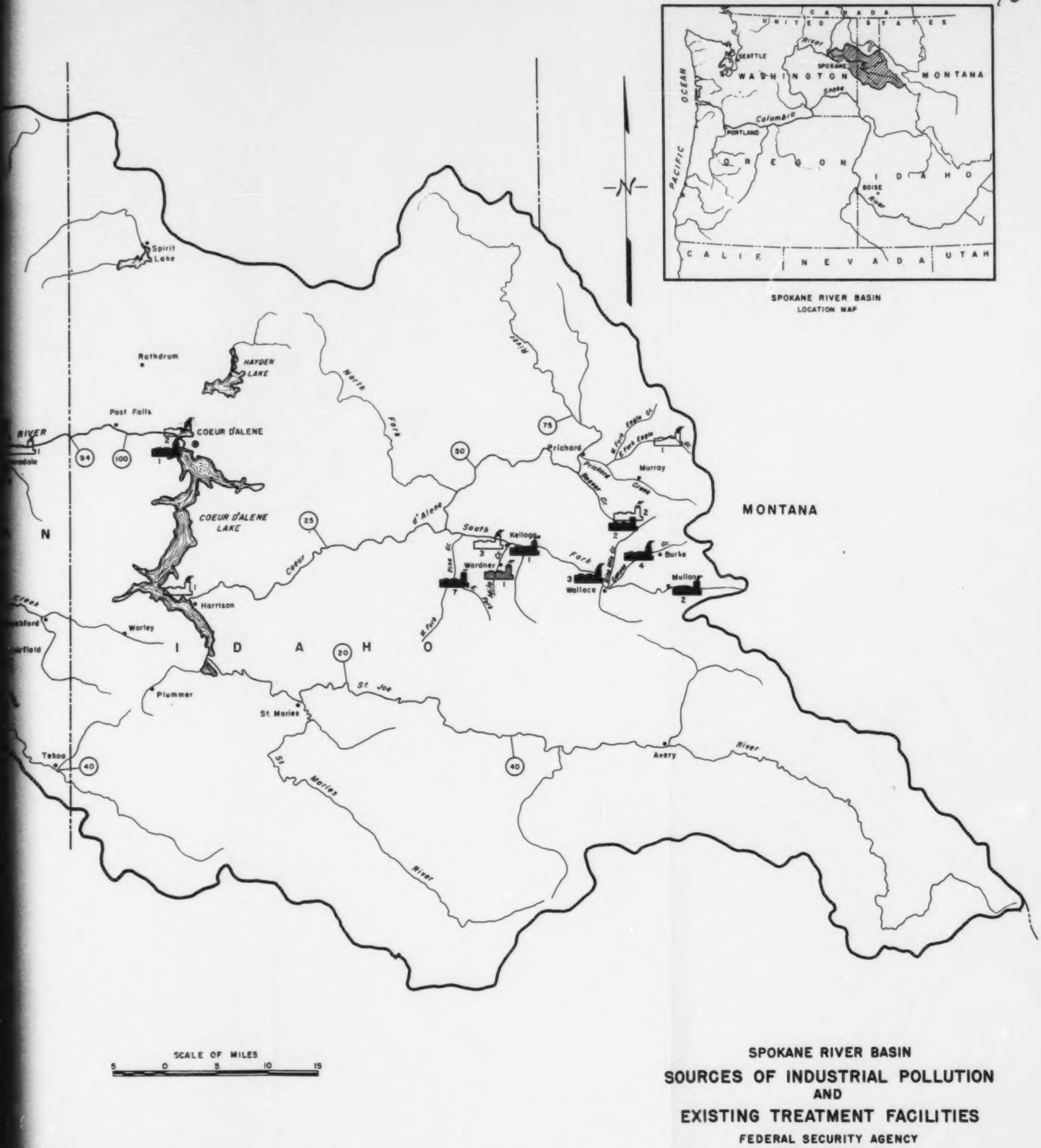
SPOKANE RIVER BASIN

SOURCES OF MUNICIPAL POLLUTION
AND
EXISTING TREATMENT FACILITIES

FEDERAL SECURITY AGENCY
Public Health Service
DIVISION OF WATER POLLUTION CONTROL

MAP No. 5

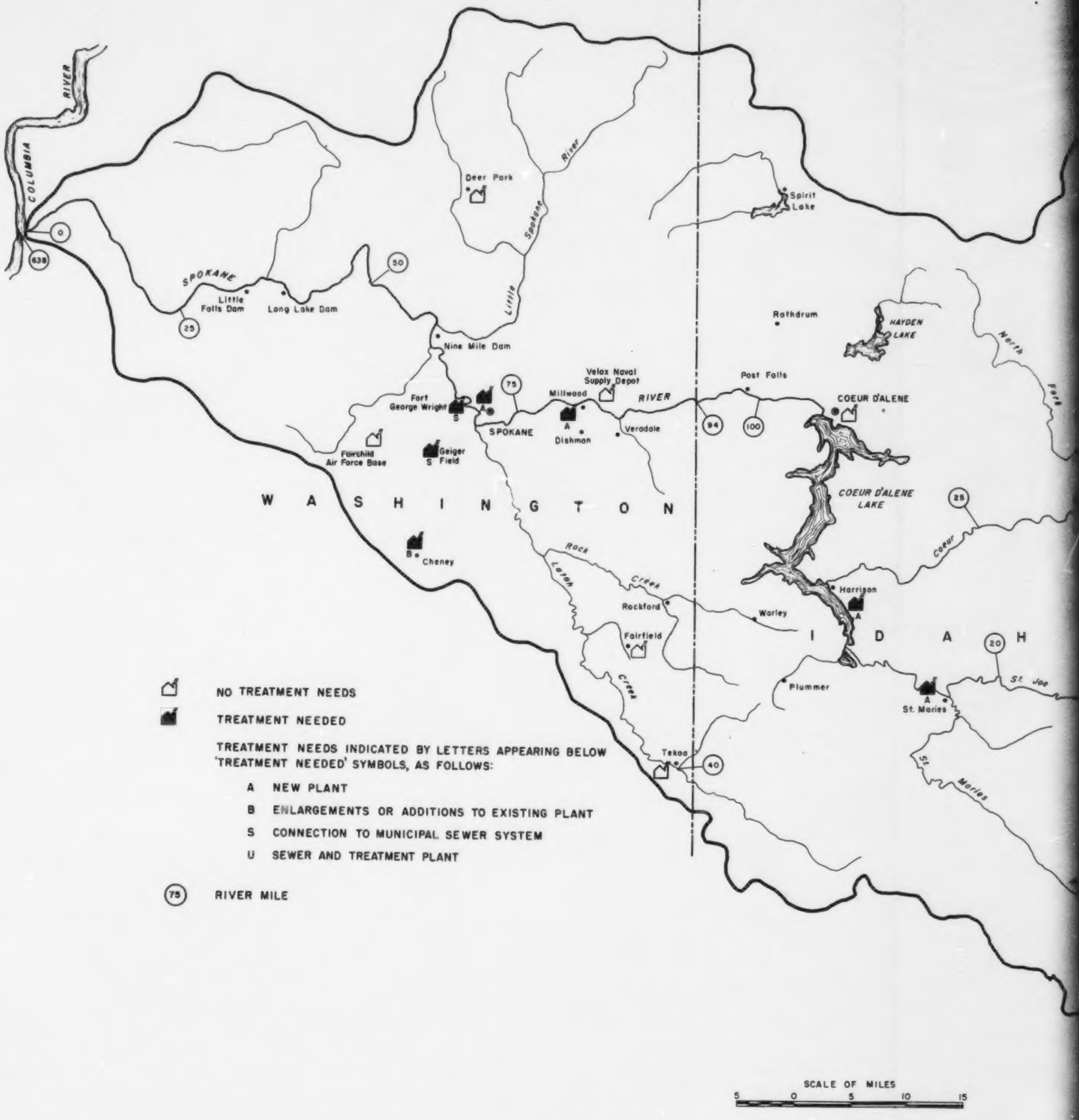

COLUMBIA RIVER
SPOKANE
RIVER
Spokane River
Little Spokane River
Deer Park
1
Spirit Lake
Little Falls Dam
Long Lake Dam
Nine Mile Dam
Mead
2
SPOKANE
2
10
Millwood
1
Dishman
2
Veradale
1
1
4
Post Falls
Rathdrum
HAYDEN LAKE
North Fork
COEUR D'ALENE
2
1
COEUR D'ALENE LAKE
Coeur d'Alene
1
Harrison
Worley
Plummer
St. Maries
St. Joe
St. Maries River
Rock Creek
Latah Creek
Rockford
Fairfield
Cheney
Tekoa
W A S H I N G T O N
I D A H O
0
638
25
50
75
94
100
25
20
40
INDUSTRIES WITH TREATMENT FACILITIES
INDUSTRIES WITH TREATMENT FACILITIES UNDETERMINED
INDUSTRIES WITH NO TREATMENT FACILITIES
NOTE–
Numbers appearing by symbols indicate total number of industrial sources of pollution in the area in the category designated.
75 RIVER MILE
SCALE OF MILES
5 0 5 10 15


C A N A D A
U N I T E D S T A T E S
SEATTLE
River
SPOKANE
W A S H I N G T O N
M O N T A N A
PACIFIC OCEAN
Snake
Columbia
PORTLAND
O R E G O N
I D A H O
BOISE
River
C A L I F.
N E V A D A
U T A H
SPOKANE RIVER BASIN
LOCATION MAP
N
Spirit Lake
Rathdrum
HAYDEN LAKE
Post Falls
RIVER
COEUR D'ALENE
94
100
75
50
North Fork
River
Prichard
W. Fork Eagle Cr.
E. Fork Eagle
Cr.
Prichard
Beaver Cr.
Murray
Creek
MONTANA
COEUR D'ALENE LAKE
25
N
Coeur
d'Alene
South
Fork
Kellogg
Wardner
Pine Cr.
Wallace
Burke
Mullan
Canyon Cr.
Harrison
Creek
Worley
I D A H O
20
St. Joe
Plummer
St. Maries
Tekoa
40
40
Avery
River
St. Maries
River
SCALE OF MILES
5 0 5 10 15

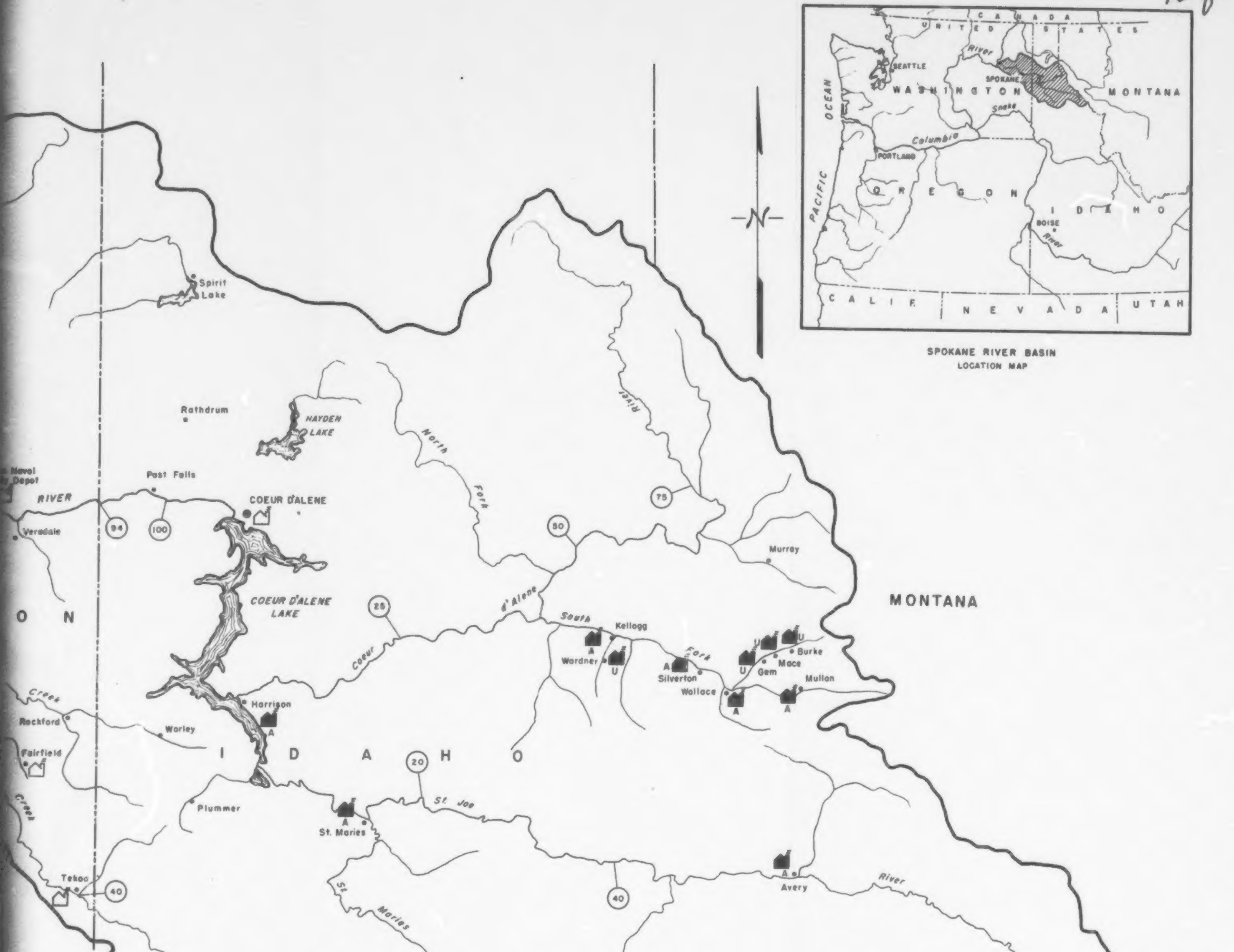
SPOKANE RIVER BASIN

SOURCES OF INDUSTRIAL POLLUTION
AND
EXISTING TREATMENT FACILITIES

FEDERAL SECURITY AGENCY
Public Health Service
DIVISION OF WATER POLLUTION CONTROL
MAP NO. 6


COLUMBIA RIVER
SPOKANE
RIVER
Little Spokane River
Deer Park
Spirit Lake
Little Falls Dam
Long Lake Dam
Nine Mile Dam
Rathdrum
HAYDEN LAKE
North Fork
Fort George Wright
S
A
SPOKANE
Millwood
Velox Naval Supply Depot
A
Dishman
Veradale
Post Falls
COEUR D'ALENE
COEUR D'ALENE LAKE
Coeur
Fairchild Air Force Base
Geiger Field
S
WASHINGTON
IDAHO
B
Cheney
Rock Creek
Latah Creek
Rockford
Fairfield
Worley
Harrison
A
Plummer
A
St. Maries
St. Joe
St. Maries
Tekoa
0
638
25
50
75
94
100
25
20
40
NO TREATMENT NEEDS
TREATMENT NEEDED
TREATMENT NEEDS INDICATED BY LETTERS APPEARING BELOW 'TREATMENT NEEDED' SYMBOLS, AS FOLLOWS:
A NEW PLANT
B ENLARGEMENTS OR ADDITIONS TO EXISTING PLANT
S CONNECTION TO MUNICIPAL SEWER SYSTEM
U SEWER AND TREATMENT PLANT
75 RIVER MILE
SCALE OF MILES
5
0
5
10
15

46-f

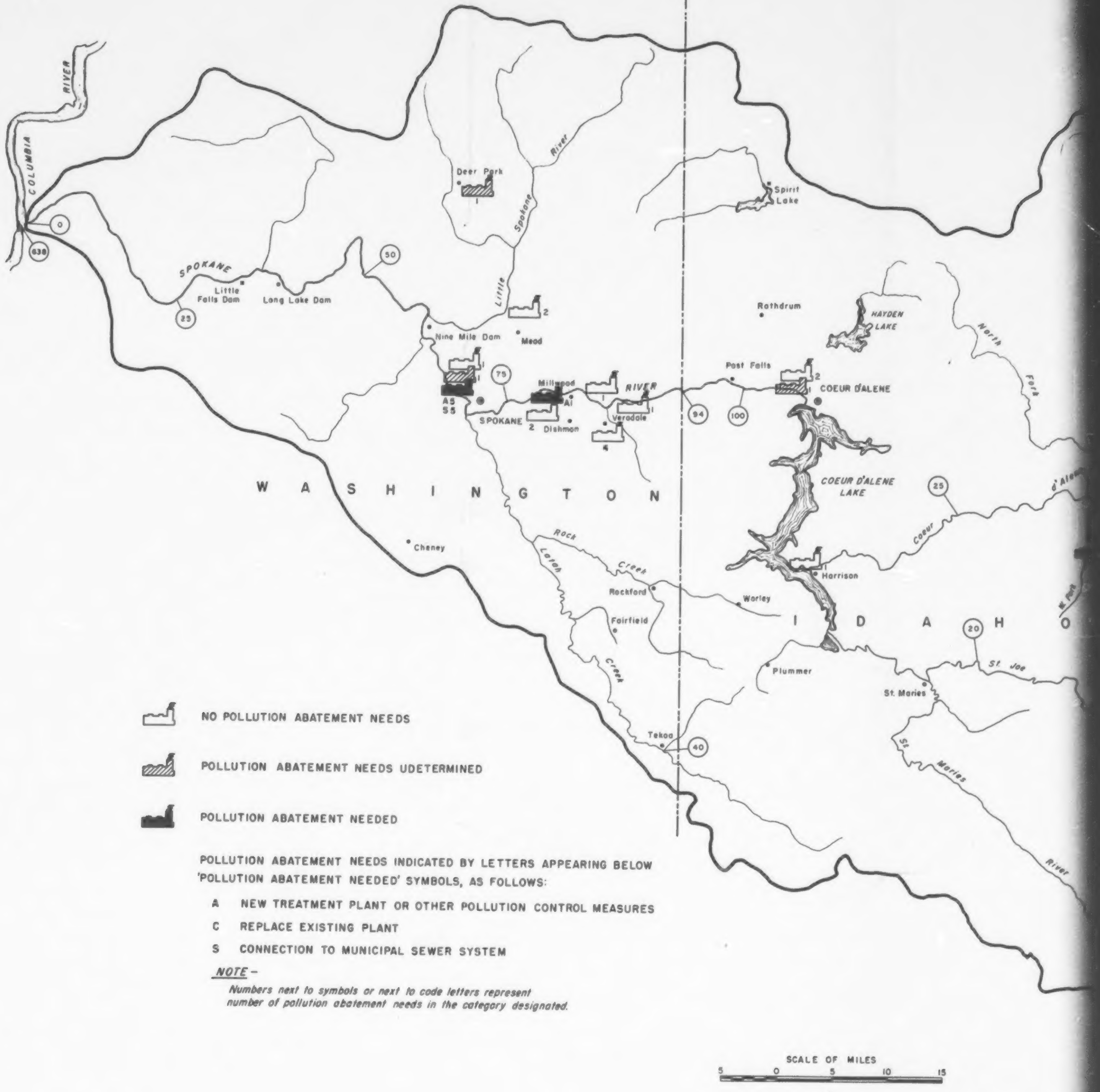

SPOKANE RIVER BASIN
LOCATION MAP
CANADA
UNITED STATES
SEATTLE
SPOKANE
River
WASHINGTON
MONTANA
Snake
Columbia
PORTLAND
PACIFIC OCEAN
OREGON
IDAHO
BOISE
River
CALIF.
NEVADA
UTAH
N
Spirit Lake
Rathdrum
HAYDEN LAKE
Naval Depot
Post Falls
RIVER
COEUR D'ALENE
Veradale
94
100
75
50
25
20
40
40
COEUR D'ALENE LAKE
North Fork
River
Murray
MONTANA
Coeur d'Alene
South Fork
Kellogg
Wardner
Silverton
Wallace
Gem
Mace
Burke
Mullan
A
U
Creek
Rockford
Harrison
Worley
Fairfield
IDAHO
Creek
Plummer
St. Joe
St. Maries
Avery
River
Tekoa
St. Maries River
ON
SCALE OF MILES
5
0
5
10
15

SPOKANE RIVER BASIN

MUNICIPAL
WASTE TREATMENT NEEDS

FEDERAL SECURITY AGENCY
Public Health Service
DIVISION OF WATER POLLUTION CONTROL

MAP NO. 7


COLUMBIA RIVER
0
638
SPOKANE
25
Little Falls Dam
Long Lake Dam
50
Deer Park
1
Little Spokane River
2
Nine Mile Dam
Mead
1
1
AS
55
75
SPOKANE
Millwood
A1
2
Dishman
1
RIVER
1
Veradale
4
94
100
Spirit Lake
Rothdrum
HAYDEN LAKE
North Fork
Post Falls
2
1
COEUR D'ALENE
COEUR D'ALENE LAKE
25
Coeur d'Alene
1
Harrison
W A S H I N G T O N
I D A H O
Cheney
Rock Creek
Latah Creek
Rockford
Worley
Fairfield
Plummer
20
St. Joe
St. Maries
St. Maries River
Tekoa
40
SCALE OF MILES
5 0 5 10 15

▭ NO POLLUTION ABATEMENT NEEDS

▨ POLLUTION ABATEMENT NEEDS UDETERMINED

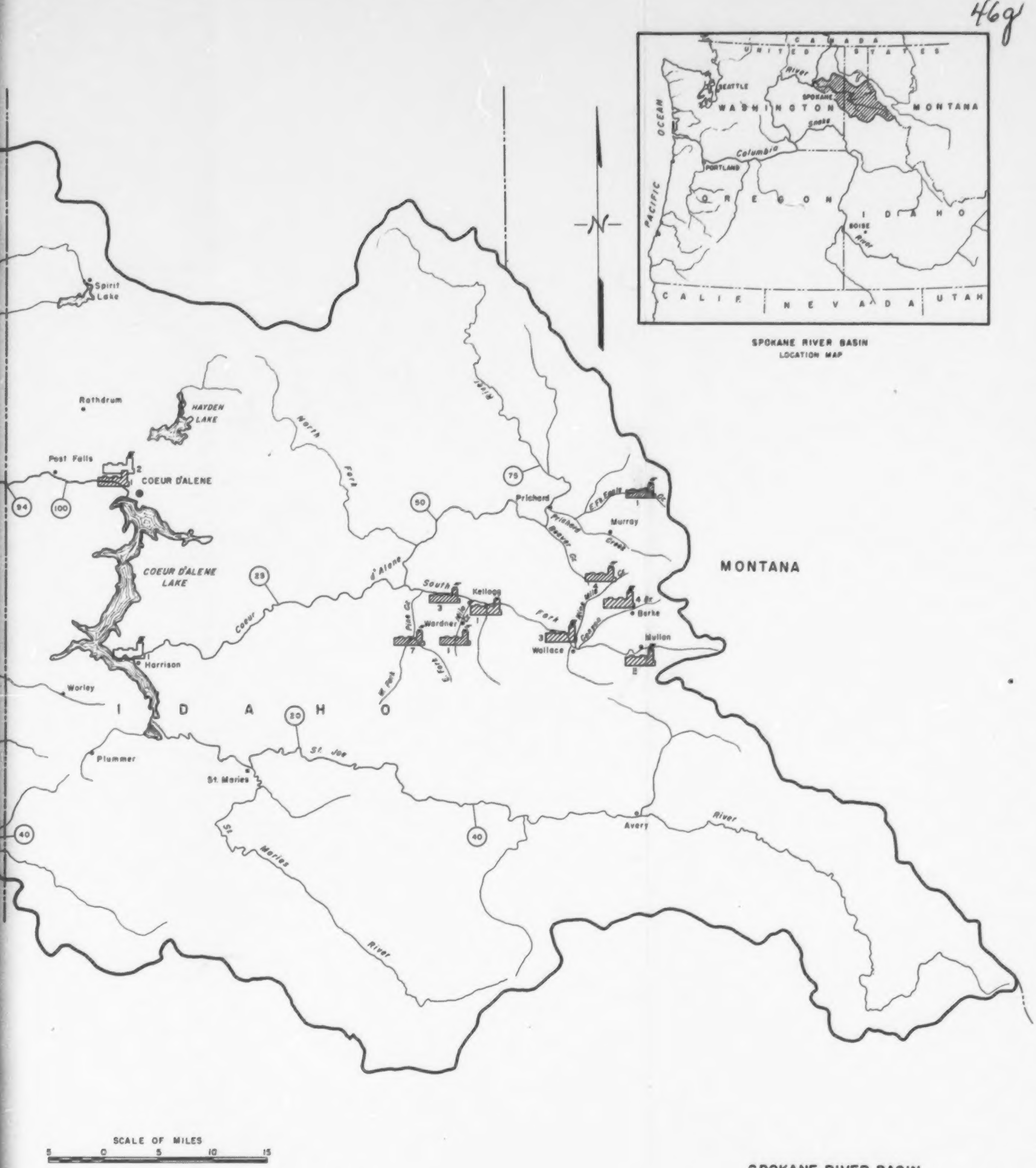
■ POLLUTION ABATEMENT NEEDED

POLLUTION ABATEMENT NEEDS INDICATED BY LETTERS APPEARING BELOW 'POLLUTION ABATEMENT NEEDED' SYMBOLS, AS FOLLOWS:

- A NEW TREATMENT PLANT OR OTHER POLLUTION CONTROL MEASURES
- C REPLACE EXISTING PLANT
- S CONNECTION TO MUNICIPAL SEWER SYSTEM

NOTE –

Numbers next to symbols or next to code letters represent number of pollution abatement needs in the category designated.

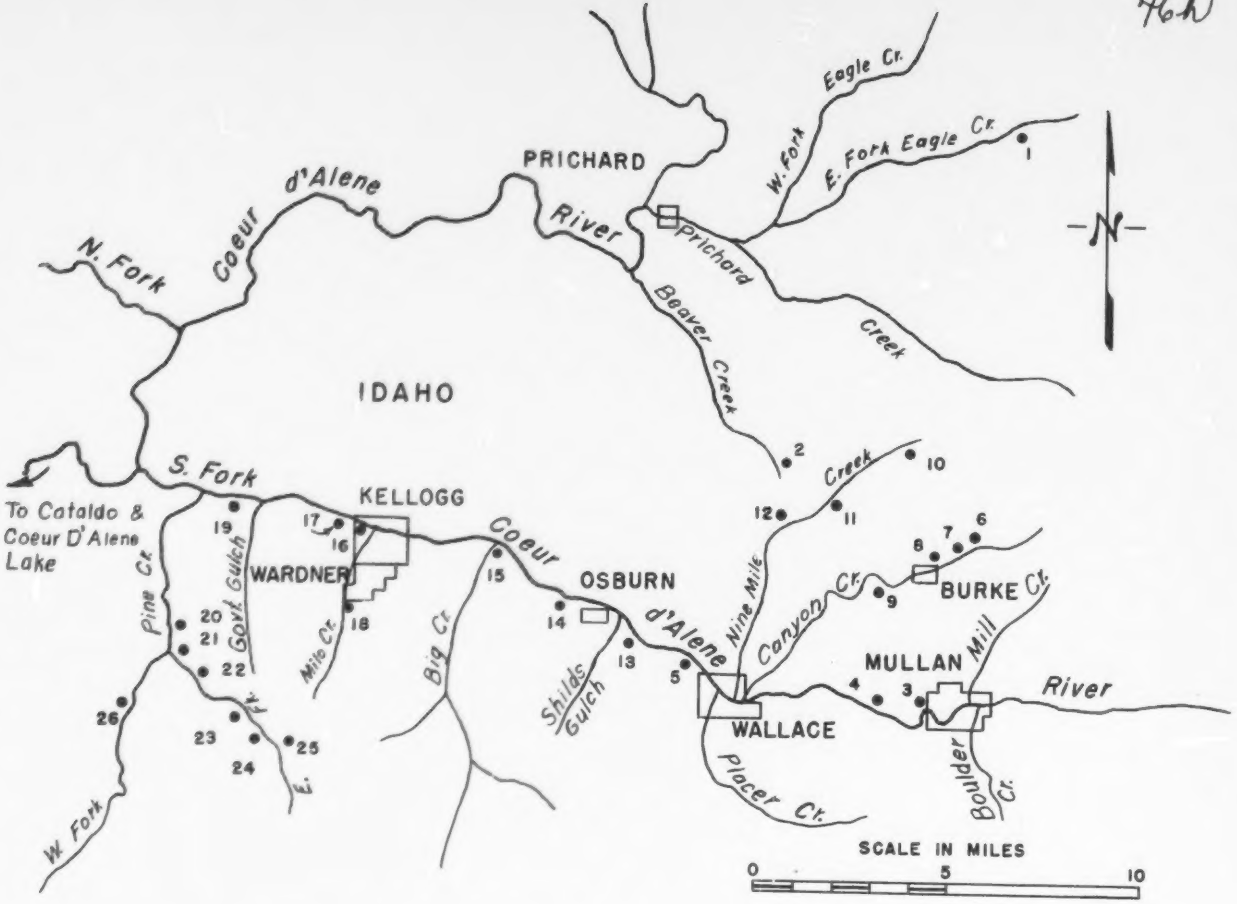

CANADA
UNITED STATES
SEATTLE
WASHINGTON
SPOKANE
River
Snake
MONTANA
PACIFIC OCEAN
Columbia
PORTLAND
OREGON
IDAHO
BOISE
River
CALIF.
NEVADA
UTAH
N
Spirit Lake
Rathdrum
HAYDEN LAKE
Post Falls
COEUR D'ALENE
COEUR D'ALENE LAKE
Harrison
Worley
Plummer
St. Maries
IDAHO
MONTANA
North Fork
River
Prichard
Prichard Creek
Beaver Cr.
E. Fk. Eagle Cr.
Murray
Coeur d'Alene
South Fork
Kellogg
Wardner
Pine Cr.
W. Fork
E. Fork
Wallace
Nine Mile Cr.
Canyon Cr.
Burke
Mullan
St. Joe
Avery
River
St. Maries River
94
100
95
50
23
20
40
40
1
2
3
7
1
1
3
4
2
SCALE OF MILES
5
0
5
10
15

SPOKANE RIVER BASIN
LOCATION MAP

SPOKANE RIVER BASIN

INDUSTRIAL POLLUTION ABATEMENT NEEDS

FEDERAL SECURITY AGENCY
Public Health Service
DIVISION OF WATER POLLUTION CONTROL
MAP No. 8


PRICHARD
Eagle Cr.
W. Fork
E. Fork Eagle Cr.
1
N
N. Fork
Coeur d'Alene River
Prichard Creek
Beaver Creek
IDAHO
2
10
Creek
S. Fork
KELLOGG
Coeur
To Cataldo & Coeur D'Alene Lake
19
17
16
12
11
8
7
6
WARDNER
15
OSBURN
Nine Mile
Canyon Cr.
9
BURKE
Cr.
Pine Cr.
Gov't Gulch
Mile Cr.
18
Big Cr.
14
d'Alene
13
Shilds Gulch
5
MULLAN
Mill
20
21
22
4
3
River
26
23
24
25
E. Fk.
WALLACE
Placer Cr.
Boulder Cr.
W. Fork
SCALE IN MILES
0
5
10

INDUSTRIAL WASTE OUTFALLS

Location	Name
1	Jack Waite Mining Co.
2	Day Mines Inc., Monitor Mining Co.
3	Federal Mining & Smelting Co., Morning Group
4	Golconda Lead Mines
5	Galena Mining Co.
6	Day Mines Inc., Hercules Mining Co.
7	Day Mines Inc., Sherman Lead Co.
8	Hecla Mining Co., Star Mine & Mill
9	Day Mines Inc., Tamarack & Custer Consolidated Mining Co.
10	Zanetti Mining & Milling Co. Rex Mill
11	Day Mines Inc., Dayrock Mining Co.
12	Wallace Meat Co.
13	Coeur d'Alene Mines Corp.
14	Polaris Mining Co.
15	Sunshine Mining Co.
16	Bunker Hill & Sullivan Mining & Concentrating Co., Mill
17	Bunker Hill & Sullivan Mining & Concentrating Co., Smelter
18	Bunker Hill & Sullivan Mining & Concentrating Co., John-George Mill
19	Federal Mining & Smelting Co., Page Group
20	Amy Silver-Lead Co.
21	Nabob Silver-Lead Co.
22	Mascot Mining Co., Denver Mill
23	Sunset Minerals, Inc.
24	Highland Surprise Consolidated Mining Co.
25	Sidney Mining Co.
26	Spokane-Idaho Mining Co.

NOTE

1. Some locations have not been verified.
2. Outfalls, not necessarily mill locations, are shown.

COEUR D'ALENE RIVER BASIN
SOURCES OF INDUSTRIAL WASTES
MAP NO. 9

SUMMARY OF IDAHO STATE WATER POLLUTION CONTROL LEGISLATION

General Statement

Idaho has no legislation which is specific in relation to water pollution except in relation to the pollution of streams which may tend to destroy or drive away from such waters any fish. While this provision relating to the protection of fish is contained in the sections administered by the Fish and Game Commission, there is no specific provision for enforcement by the Fish and Game Commission (Sec. 36-1101, Idaho Code).

The criminal code of Idaho provides that it shall be a misdemeanor for any person to empty or place or cause to be emptied or placed into any canal, ditch, flume, or reservoir any rubbish or filth (Sec. 18-4301, Idaho Code). It is made a misdemeanor for any person to knowingly leave the carcass of any animal within a quarter of a mile of any stream of water for a longer period than 24 hours without burying the same and by such exposure or burial within 200 feet of any stream, canal, ditch, flume, or other irrigation works to so pollute or contaminate as to render unfit for domestic use any natural stream of water or the water of any canal, ditch, flume, or other irrigation works used by others for domestic purposes (Sec. 18-5807, Idaho Code). Any person who puts the carcass of any dead animal, or the offal of any slaughter pen, corral or butcher shop into any river, creek or pond is guilty of a misdemeanor (Sec. 18-5803, Idaho Code).

There is no specific power granted to the Department of Public Health in the statutes relating to pollution of waters; therefore, any authority the Department may have in this area must be drawn from general language giving the Department of Public Health general supervision of all matters relating to the preservation of the life and health of the people of the State which includes sanitary investigations and inquiries respecting the causes of disease (Secs. 39-101 and 67-3104, Idaho Code).

The Surgeon General has designated the Department of Public Health as the State water pollution control agency pursuant to the Water Pollution Control Act.

In 1947 the Idaho legislature passed an act creating a committee to be known as "Water and Stream Utilization Committee" which was to consist of the State Reclamation Engineer, the Director of Public Health, and the Director of the Idaho State Fish and Game Commission, and six lay members to be appointed by the Governor. This Committee was formed merely to study the questions and problems concerning the beneficial use of the waters and streams of the State of Idaho, including a study of pollution of all waters and streams of the State, and to compile records of its investigations. This Committee was to report on its findings before the first Monday in January 1949. However, this act expired February 15, 1949, and the legislature took no action relating to the findings by this Committee, nor did it set up any State agency which was concerned chiefly with the pollution of streams within the State (Ch. 185, Session Laws of Idaho, 1947).

Administrative Organization

The Department of Public Health is the administrative organization named to administer the public health laws. What jurisdiction it has in the area of water pollution control is statewide.

Public health programs which are administered by county boards of health and public health districts on a local basis are subject to the general supervision of the State Department of Public Health. Through their general powers, such as the adoption of rules and regulations and the suppression of unhealthy nuisances, these local units presumably would have some authority over local pollution (Secs. 39-301 and 39-401, Idaho Code).

At the head of the State Department of Public Health is a Commissioner of Public Health, which office is held ex-officio by the Governor (Secs. 67-2403 and 67-2407, Idaho Code). The Commissioner appoints a Director of Public Health who serves as executive and administrative officer of the Department (Sec. 67-2407, Idaho Code). Water pollution control activities are centered in a Division of Public Health Engineering, created by administrative action.

There is no advisory council established by law. However, a voluntary "Water Resources Advisory Committee" has been appointed by the Governor.

Powers and Duties

(1) Development of comprehensive program: -- The statutes do not provide for the development of a comprehensive program.

(2) Issuance of permits and review of plans and specifications: --No provisions.

(3) Enforcement: -- There are no provisions for the issuance of orders by the Department of Public Health or for administrative hearings and court reviews. Specified acts of pollution are made a misdemeanor by the statutes. No provision is made for summary action.

(4) Conduct of studies, investigations, and research: -- As stated above, Chapter 185, Session Laws of Idaho, 1947, set up a committee to conduct studies relating to water pollution. The duties of

this committee expired February 15, 1949, and there are no specific provisions in the present law for studies relating to water pollution.

(5) Cooperation with other public and private agencies: -- The Department of Public Health is authorized to enter into contracts and cooperative agreements with counties, municipalities, and school districts of the State and with other agencies for the administration of public health. It is also authorized to advise, assist, and cooperate with the Federal Government or any of its agencies or other departments in the exercise of any of the powers and duties of the Department (Sec. 67-3104, Idaho Code).

(6) Administrative powers: -- The Department of Public Health has the power to make rules and regulations and such orders as may be necessary or desirable for carrying out its various functions, which rules, regulations, and orders shall be binding upon cooperating local units in all public health activities supported in whole or in part by State or Federal funds (Sec. 67-3104, Idaho Code).

Exemptions from Operation of Act

In the provision of the statutes relating to the prohibition of pollution of any stream or lake which will tend to destroy, drive away from such waters or kill any fish, there is an exemption whereby owners of any quartz mill or reduction works may operate such quartz mill or reduction works where the owner has built a suitable dam for settling purposes, provided that before such dam is built the Director of the Fish and Game Department shall approve the plan for such dam (Sec. 36-1101, Idaho Code).

Preservation of Existing Rights and Remedies

This matter is not covered by the Idaho statutes.

Statement of Polity, Severability Clause, etc.

None

Interstate Agencies

Idaho is not a member of any interstate water pollution agency.

SUMMARY OF WASHINGTON STATE WATER POLLUTION CONTROL LEGISLATION

General Statement

Chapt. 216, Laws of 1945, codified as Secs. 10964a - 19064u, Remington's Revised Statutes, enacts a comprehensive water pollution control law and established a Pollution Control Commission. There is also provision for formation of local sewer districts, not to include any incorporated territory, for the purpose of constructing sewer systems in districts and erecting sewage treatment plants (Secs. 9425-10 to 9425-58). The Pollution Control Commission is the agency designated by the Surgeon General pursuant to the Federal Water Pollution Control Act.

Administrative Organization

The Pollution Control Commission is an independent agency; the Commission is composed of the Director of the Department of Conservation and Development, the Director of the Department of Fisheries, the Director of the Department of Game, the Director of the Department of Health, and the Director of the Department of Agriculture (10964c). The Director is to be appointed by the Governor, his salary fixed by the Governor, and he is subject to removal by the Governor at his pleasure (10964e). The Director is the executive officer of the Commission and coordinates and supervises its activities, reports on the work of the staff to the Commission, and has general charge of the operating, staffing, directing, etc., of the Commission's activities (10964g). The Commission has jurisdiction to control and prevent pollution of streams, lakes, rivers, ponds, inland waters, salt waters, water courses and other surface and underground waters of the State (10964j). There is no specific provision for delegation of authority by the executive officer, nor for appointment of an advisory council. However, the Chief Public Health Engineer of the State Department of Health is technical secretary of the Commission, and he may be assisted, when necessary, by technical advisers from the departments represented on the Commission (10964g and h).

Powers and Duties

(1) Development of comprehensive program: -- The Commission appears to have authority to develop a comprehensive program; it has jurisdiction over all waters in the State, fresh and salt, surface and underground (10964j). It shall determine what qualities and properties indicate a significant pollution of water (10964m). The Commission has the power to classify the various uses of the waters of the State (10964m).

(2) Approval of plans and specifications: -- Sec. 10964q requires the Commission to approve, prior to the beginning of construction, all plans and specifications for the construction of new sewerage systems, sewage treatment and disposal plants, or systems, or for improvements or extensions to existing sewerage systems or sewage treatment or disposal plants. No provisions for licensing a new industry or business which may constitute a source of pollution is contained in the law.

(3) Enforcement: -- When the Commission is of the opinion that any person is violating any provision of the Act, the Commission shall so notify such persons, who shall then advise the Commission, within 15 days, of the steps being taken to control the pollution, etc.; the Commission may then issue such order or directive as is appropriate (10964r). An administrative hearing is to be granted by the Commission to any person who feels himself aggrieved by such order or directive. On conclusion of the hearing, the Commission shall issue such order or directive as is appropriate, which shall be final and conclusive, unless a petition is filed within 15 days in the Superior Court of the county in which the affected system or plant or portion thereof is situated. In court, the order or directive is subject to review and trial de novo as a cause in equity. The effect of the order or directive is stayed pending a hearing by the Commission or trial by court, except in case of an emergency affecting the public health (10964s). The Commission is authorized to bring suit in law or equity to enforce the provisions of the law (10964n). Any person who violates a provision of the law or a final order or directive of the Commission is guilty of a gross misdemeanor, subject to jail and fine; each day of violation is a separate violation (10964t). In case of emergency on account of any discharge or threatened discharge of waste matter polluting or tending to pollute the waters of the State, the Commission shall seek injunctive or abatement relief (10964 1).

(4) Conduct of studies, investigations and research: -- The Commission or its agent shall have the right to enter on public or private property at any reasonable time to inspect and investigate conditions relating to pollution or possible pollution of waters (10964o). There is no express authority to conduct studies or research, but Sec. 10964a states the purposes of the law to be to "Require the use of all known available and reasonable methods by industries and others to prevent and control the pollution" of State waters; Sec. 10964k authorizes setting of standards and 10964p authorizes the Commission to request and receive assistance of any educational institution or State agency when the Commission deems it necessary for carrying out the provisions of the law. From the above-quoted provision, authority to conduct studies and research might well be inferred.

(5) Cooperation with other public and private agencies: -- Secs. 10964pp and 10964ppl were enacted in 1949. Sec. 10964pp authorizes the Commission to cooperate with the Federal government and accept Federal funds for carrying out the provisions of the Act; and Sec. 10964ppl authorizes the Commission to cooperate with appropriate agencies of neighboring States, and to enter into contracts and make contributions toward interstate projects to carry out the purposes of the Act.

(6) Administrative powers: -- The Commission may hold hearings under the provisions of Sec. 10964s. There is no specific provision for administering oaths, subpoenaing witnesses or paying witness fees. The Commission has authority to inspect and investigate under Sec. 10964o; to issue permits for building sewerage systems, etc., without which construction cannot be started under Sec. 10964q; to issue orders subject to review by hearing before the Commission, and subsequently by trial de novo in court under Sec. 10964s. The Commission has authority to adopt and enforce rules and regulations and standards consistent with known available and reasonable methods of preventing pollution and consistent with the public welfare to carry out the provisions of this Act (10964k). No particular procedure is prescribed by the law, but the Commission is authorized by Sec. 10964f to prescribe its own procedures.

Exemptions from Operation of Act

There are no specific exemptions from the operation of this Act.

Preservation of Existing Rights and Remedies

No specific provisions on this point.

Statement of Policy, Severability Clause, etc.

Sec. 10964a states the public policy of the State of Washington to be to "maintain the highest possible standards to insure the purity of all waters of the State consistent with public health and public enjoyment thereof, the propagation and protection of wild life, birds, game, fish and other aquatic life of the State, and to that end require the use of all known available and reasonable methods by industries and others to prevent and control the pollution of the waters of the State of Washington."

The law contains no severability provision, but does provide in Sec. 10964u that in case of conflict between this law and other laws relating to the pollution of waters, this law shall be deemed and construed as ancillary to and supplementing the prior law and in addition to the laws now in force, except as the same may be in direct conflict herewith.

Interstate Agencies

Sec. 10964ptl, enacted in 1949 authorizes the State Commission to enter into contracts with neighboring states and to make contributions toward interstate projects to carry out the purposes of the Act. By Chapt. 29, Laws of 1947, the State entered into a compact with Oregon and California, the Pacific States Marine Fisheries Commission, for the utilization, protection and conservation of fisheries in areas of the Pacific Ocean under jurisdiction of these States. The compact has received Congressional approval (61 Stat. 419, 7/24/47).

COEUR D'ALENE RIVER AND LAKE SURVEY 1930

Summarized from "Report of Investigations on Pollution of Coeur d'Alene River and Lake Coeur d'Alene June 11 to September 10, 1930," by Edw. C. O'Keeffe for Federal Mining and Smelting Company, Wallace Testing Plant, Wallace, Idaho.

During the period of this survey five visits were made to the area for the purpose of obtaining samples of river and lake waters for chemical analyses. On two of the visits samples were collected for bacterial analyses. The chemical analyses determined the concentrations of silver, lead, zinc, copper and iron. Following are results of the analyses:

COEUR D'ALENE RIVER

	Rose Lake	Medimont	Springston	Harrison
Miles Above Mouth	27	16	13	10
Analysis of June 11 -- p.p.m. shown in brackets ( )* (Flow 1800 c.f.s.)				
Inorganic Solids (Tons per day)	212. (43.6)	128. (26.3)	120. (24.7)	113. (23.3)
Silver (Oz. per ton)	0.4 (0.00055)	--- ---	0.6 (0.00046)	--- ---
Lead (Pb in %)	0.36 (0.16)	0.30 (0.08)	0.35 (0.09)	0.45 (0.10)
Zinc (Zn in %)	2.3 (1.00)	1.8 (0.47)	2.0 (0.49)	1.9 (0.44)
Copper (Cu in %)	Tr.	Tr.	Tr.	Tr.
Iron (Fe in %)	8.9 (3.88)	8.5 (2.24)	7.6 (1.88)	8.4 (1.96)
Insolubles (%)	73.5 (32.0)	69.3 (18.23)	69.1 (17.07)	66.5 (15.49)
Analysis of August 20 (Flow 300 c.f.s.)				
Inorganic Solids (Tons per day)	66. (81.4)	12. (14.8)	0.52 (0.64)	Tr.
Silver (Oz. per ton)	0.4 (0.0010)	0.3 (0.00014)	--- ---	--- ---
Lead (Pb in %)	0.4 (0.33)	0.3 (0.04)	--- ---	--- ---
Zinc (Zn in %)	2.5 (2.04)	2.5 (0.37)	--- ---	--- ---
Copper (Cu in %)	Tr.	Tr.	--- ---	--- ---
Iron (Fe in %)	7.7 (6.27)	7.9 (1.17)	--- ---	--- ---
SiO_2 (in %)	66.0 (53.73)	65.8 (9.74)	--- ---	--- ---
Al_2O_3 (in %)	18.0 (14.65)	17.8 (2.63)	--- ---	--- ---
CaO (in %)	1.1 (0.90)	0.84 (0.12)	--- ---	--- ---
MgO (in %)	0.58 (0.47)	0.60 (0.09)	--- ---	--- ---

* Calculation of parts per million made by Idaho Department of Public Health.

Coeur d'Alene River (Cont.)

Partial Analysis After Settlement (p.p.m.)

	Rose Lake	**Medimont**	**Springston**	**Harrison**
Pb	No	No	No	No
Zn	No	No	No	No
Cu	No	No	No	No
SiO_2	17.	17.	12.	20.
Ca	12.8	9.2	10.7	9.2
Mg	3.6	2.4	3.0	2.4
SO_4	16.9	9.9	8.2	10.5
Cl	1.0	1.5	1.5	1.0
Na + K	0.7	1.0	1.3	1.3
Total Solids	71.	60.	60.	62.

Bacteriological Data (August 8)

B. coli count per 100 c.c.	9	6	--	0

COEUR D'ALENE LAKE

Analysis of June 24

p.p.m. shown in brackets ( )*	Harlow Point	East Point	Driftwood Point	Coeur d'Alene Intake
Miles above Lake outlet	19	16.5	8	2
Volume of Sample (Gallons)	125	100	100	105
Inorganic Solids (Grams)	1.800 (3.81)	0.511 (1.35)	0.249 (0.66)	0
Silver (Oz. per ton)	--- ---	0.4	--- ---	---
Lead (Pb in %)	0.29 (0.011)	0.25 (0.0034)	0.31 (0.0021)	---
Zinc (Zn in %)	1.79 (0.068)	2.3 (0.031)	1.9 (0.013)	---
Copper (Cu in %)	Tr.	Tr.	Tr.	---
Iron (Fe in %)	6.0 (0.23)	6.2 (0.084)	6.2 (0.041)	---
Insolubles (in %)	74.2 (2.83)	70.2 (0.95)	69.7 (0.46)	---

* Calculation of parts per million made by Idaho Dept. of Public Health.

Partial Analysis After Settlement (p.p.m.)

Pb	No	No	No	No
Zn	No	No	No	No
Cu	No	No	No	No
SiO_2	5.	5.	11.	7.0
Ca	8.9	10.0	9.0	8.0
Mg	3.8	3.0	4.2	3.0
Cl	2.	3.	3.	3.0
SO_4	3.7	4.1	5.3	6.6
CO_3	16.0	20.9	20.3	17.3
Na + K	3.6	3.0	1.2	1.2
Total Solids	46.	51.	55.	55.

Bacteriological Data (August 8)

B. coli count per 100 c.c.	3	--	--	0

It was estimated during this survey that about 5,400 tons of ore were being milled daily and that 85 percent were tailings entering the river. This represents a total of 4,610 tons of tailings per day.

COEUR D'ALENE RIVER AND LAKE SURVEYS 1932

Summarized from reports prepared by Idaho State Department of Public Welfare, Bureau of Mines, Public Health Service and U. S. Bureau of Fisheries for Coeur d'Alene River and Lake Commission for inclusion in its Report to the Twenty-Second Session of the State Legislature of Idaho.

The twenty-first session of the State Legislature enacted Chapter 199 Session Laws of 1931, Sections 68-201 to 68-208 I.C.A., inclusive, creating the Coeur d'Alene Lake Commission, composed of the chairmen of the Boards of County Commissioners of Kootenai and Shoshone Counties and the Attorney General of the State of Idaho. The duties of the Commission were to study and investigate ways and means of eliminating from the Coeur d'Alene River and Coeur d'Alene Lake, so far as practicable, all industrial wastes which pollute or tend to pollute the waters and to recommend methods of preventing pollution detrimental to vegetation and domestic crops; to public health or to the health of animals, fish and other aquatic life, or detrimental to the use of waters for recreational purposes.

Cause for the action by the State Legislature in setting up this Commission was a law suit against the mining interests instituted by land owners along the river claiming damages to their lands and livestock by reason of mine wastes. They contended that these mine wastes were of a highly toxic nature and were injurious to vegetation as well as fish and animal life. Much reference was made to leaded water, leaded hay and leaded soil. As a result of this litigation the mine owners procured easements which were to be in payment of damages for the loss of crops, domestic animals, etc.

The Commission called in various State and Federal agencies to investigate the pollution of the river and lake waters in 1932. Summerized results of water and soil analyses are included in the following tables:

Lead in Coeur d'Alene River Water at Harrison Highway Bridge

		Total lead in solution and in suspension		Separate determination of lead in solution and in suspension		
Sample No.	Date	Depth sampled, feet	Total, p.p.m. or mg./L	Depth sampled, feet	Solution p.p.m. or mg./L	Suspension, p.p.m. or mg./L
1	11/5/31	--	Lost	--	--	--
2	11/20/31	--	0.39	--	--	--
3	12/10/31	--	0.29	--	--	--
4	12/24/31	--	0.59	--	--	--
5	1/7/32	--	0.21	--	--	--
6	1/21/32	20	0.43	20	0.07	--
7	3/26/32	10 and 20*	1.17	10 and 20*	0.02	--
8	4/9/32	10 and 20*	0.58	10 and 20*	0.02	--
9	4/21/32	10	0.82	20	0.12	0.58
10	5/4/32	10	0.52	20	0.18	0.27
11	5/19/32	10	0.56	10	0.17	0.34
12	6/9/32	10	0.72	--	--	--
13	6/23/32	10	0.35)Ave.	--	--	--
13b	6/23/32	20	0.49)0.44	--	--	--
14	7/7/32	10	0.27)Ave.	--	--	--
14b	7/7/32	20	0.83)0.55	--	--	--
15	8/4/32	10	0.35)Ave.	--	--	--
15b	8/4/32	20	0.35)0.35	--	--	--
16	9/1/32	10	0.25)Ave.	--	--	--
16b	9/1/32	20	0.44)0.35	--	--	--
17	9/23/32	10	0.31)Ave.	--	--	--
17b	9/23/32	20	0.32)0.32	--	--	--

* Composite of two samples from the depths designated.

Report of Bureau of Mines, Table No. 2, Page 43.

Lead in Water Samples Above Mouth of Coeur d'Alene River and St. Joe River
1931 - 1932

Sample	Location of Sample	Lead in Solution, p.p.m. or mg./L	Lead in suspended matter in water		Total lead, p.p.m. or mg./L
			p.p.m. or mg./L	Percent of dry solids	
A	South Fork, Coeur d'Alene River, above junction with North Fork	0.002*	10	0.23	10
B	North Fork, Coeur d'Alene River, above junction with South Fork	0.002*	0.006**	0.02	0.006**
H	Coeur d'Alene River under highway bridge at Harrison - one foot under surface	0.002*	0.12	0.14	0.12
N	Coeur d'Alene River above Cataldo	0.002*	0.23	0.21	0.23
O	Thompson Lake near canal to Coeur d'Alene River, current toward river	0.002*	0.003**	0.03	0.003**
P	Slough halfway between Thompson Lake and Harrison. Swamps where wild fowl feed	0.104	68***	0.32	68.1***
R	Eagle Creek, 60 feet below Jack Waite Mill impounding dam	0.16	1.37	0.30	1.53
M	St. Joe River, 600 yards above mouth	0.002*	0.003**	0.03	0.003**

* Less than 0.005 milligrams lead found (limit of Method) in samples of 2241 to 2733 gram size; essentially no lead present.

** Less than amount reported.

*** Large amount of solids due to stirring up bottom sediment when taking sample of water.

Report of Bureau of Mines, Table No. 3, Page 47.

Lead in Samples of Solids from Bottom Surface of Coeur d'Alene River and Lake, and from St. Joe River
1932

Sample No.	Location and Description	Lead found, percent of dry solids
2	Coeur d'Alene River government gaging station, Cataldo...	0.93
22	Coeur d'Alene River at center of mouth. Luxuriant growth of water weeds. Water about 19 ft. deep..............	0.70
23	Coeur d'Alene Lake about 300 yds. out from Harlow Point. Water about 63 ft. deep................................	0.87
26	Coeur d'Alene Lake about 1 mi. south of Harrison.........	0.68
24	St. Joe River about 3 mi. above mouth. Water 42 ft. deep	0.04

Report of Bureau of Mines, Table No. 4, Page 53.

Lead in Soil Samples
1932

Sample No.	Location and Description	Lead found, percent by weight of dry solids
3	Slimes along bank, government gaging station, Cataldo....	0.58
4	Barren field, government gaging station.................	0.59
5	Fertile field 400 yds. from river, government gaging station..	0.02
6	Deposit from floods at Enaville.........................	0.57
7	Same location as sample 6 but 30 ft. nearer river........	0.87
8	Mission Flats, soil 60-75 ft. from river.................	0.72
11	Dudley, white crusty deposits on bank	0.88
15	Harrison, river bank at bridge, clay-like soil..........	0.02
17	Same location as sample 15; white crusty deposit along road in barren ground near river......................	0.11
18	St. Joe River, soil off bank 6½ mi. below St. Maries.....	0.001

Report of Bureau of Mines, Table No. 5, Page 54.

General Chemical Composition of Soil Incrustations Along the Coeur d'Alene River as Shown by Analyses of Samples from Near Harrison, Idaho, From Thompson Flat, and From Bradley, Idaho, During July, 1931* and 1932**

By M. M. Ellis, Ph.D., Sc.D., In Charge, Interior Fisheries Investigations, United States Bureau of Fisheries

Total zinc as Zn	5.0 to 12.0 percent
Total lead as Pb	0.3 to 0.8 percent
Total iron as Fe	Trace to 9.0 percent
Total manganese as Mn	Trace to 4.0 percent
Total copper as Cu	Traces in some samples
Total arsenic as As	Traces in some samples
Material freely soluble in water	3.0 to 39.0 percent
Soluble zinc as zinc sulphate	60 to 85 percent of soluble fraction
Other soluble sulphates, computed as sodium sulphate	5 to 20 percent of soluble fraction
Soluble chlorides	Small amounts
Soluble carbonates	Small amounts

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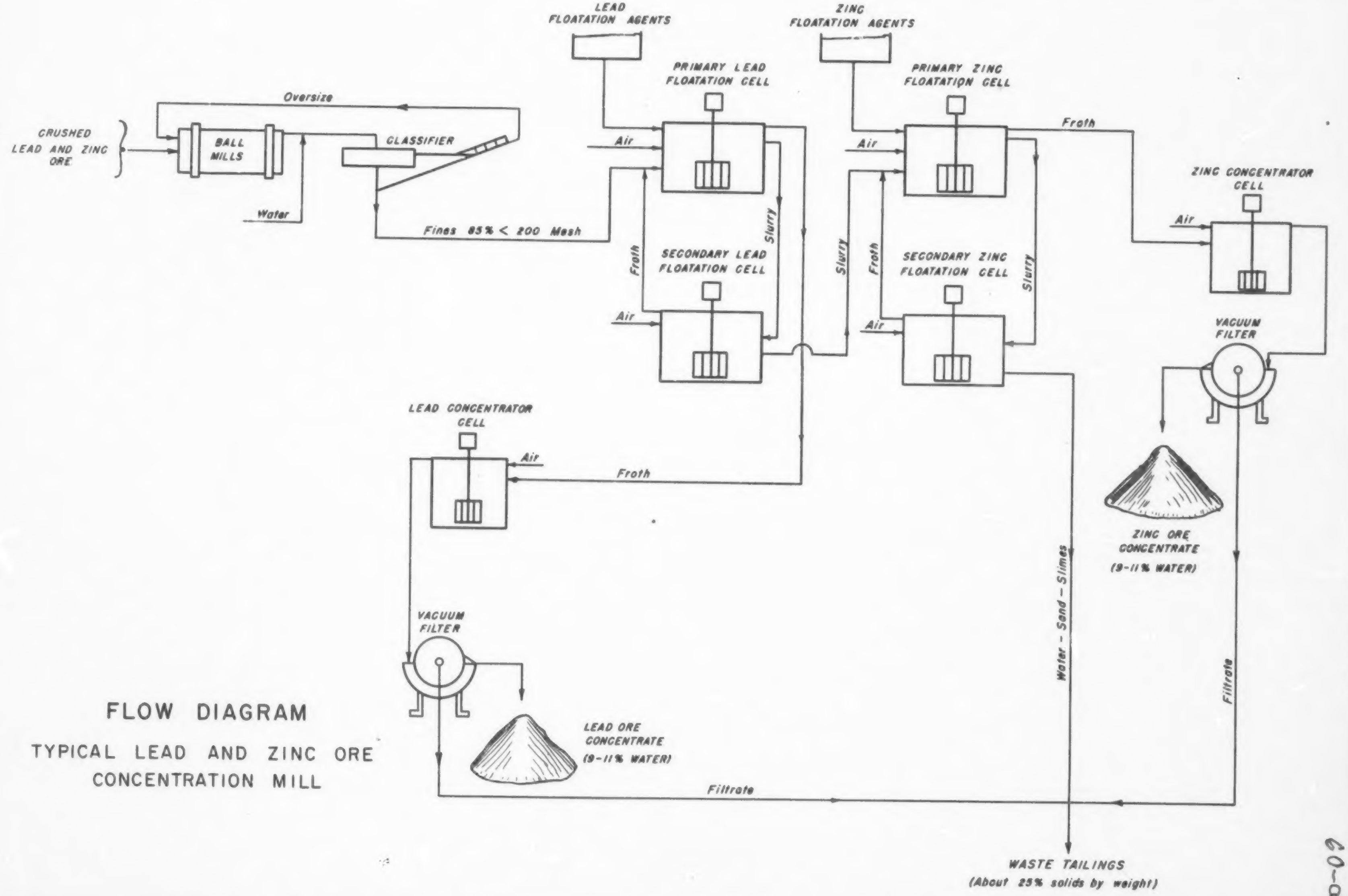
* Analysis from laboratory of the Division of Soils Chemistry and Physics, United States Department of Agriculture.

** Analysis from laboratories of the U. S. Bureau of Fisheries, Columbia Field Station, and from Department of Physical Chemistry, University of Missouri.

Report of U. S. Bureau of Fisheries, Table No. 4, Page 102.


CRUSHED LEAD AND ZINC ORE
BALL MILLS
Water
Oversize
CLASSIFIER
Fines 85% < 200 Mesh
LEAD FLOATATION AGENTS
Air
PRIMARY LEAD FLOATATION CELL
Froth
Slurry
SECONDARY LEAD FLOATATION CELL
Air
ZINC FLOATATION AGENTS
Air
PRIMARY ZINC FLOATATION CELL
Slurry
Froth
SECONDARY ZINC FLOATATION CELL
Air
Slurry
Froth
ZINC CONCENTRATOR CELL
Air
VACUUM FILTER
ZINC ORE CONCENTRATE (9-11% WATER)
LEAD CONCENTRATOR CELL
Air
Froth
VACUUM FILTER
LEAD ORE CONCENTRATE (9-11% WATER)
Filtrate
Water - Sand - Slimes
Filtrate
WASTE TAILINGS (About 25% solids by weight)

FLOW DIAGRAM

TYPICAL LEAD AND ZINC ORE
CONCENTRATION MILL

Summary of Lead Examinations
Coeur d'Alene Lake Waters
1931 - 1932

By J. K. Hoskins, Sanitary Engineer in Charge Stream Pollution Investigations Station, Cincinnati, Ohio

Sta. No.	Location	Lead Content in P.P.M. Max.	Min.	Ave.	Ave. for Flood Period*
1.	Lake at Harrison Intake	2.25	0.10	0.36	0.88
2.	River at Harrison Highway Br.	1.60	0.12	0.43	0.55
3.	Lake at mouth Coeur d'Alene R.	0.75	0.12	0.27	0.45
4.	Lake off Harlow Point	0.30	0.06	0.17	0.24
5.	Lake off East Point	0.37	0.08	0.15	0.25
6.	Lake off McDonald Point	0.32	0.06	0.13	0.21
7.	Lake off Driftwood Point	0.20	0.06	0.12	0.18
8.	Lake off Niggerhead Point	0.19	0.07	0.12	0.15
9.	Lake at Coeur d'Alene Intake	0.96	0.06	0.22	0.12

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* Flood period assumed to comprise samples of March 26, April 9 and 21 and May 5, 1932

Table No. 11, Page 17 of Mr. Hoskins' Report.

Summary of Lead Examinations Coeur d'Alene Waters
1931 - 1932

By W. V. Leonard, State Chemist and Sanitary Engineer, Department of Public Welfare, Boise, Idaho

Sta. No.	Location	Lead Content in P.P.M. Max.	Min.	Ave.
1.	Lake at Harrison Intake	0.60	0.08	0.26
2.	River at Harrison Highway Bridge	1.60	0.14	0.40
3.	Lake opposite mouth of Coeur d'Alene River	1.00	0.10	0.31
4.	Lake opposite Harlow Point	0.30	0.04	0.17
5.	Lake opposite East Point	0.40	0.06	0.17
6.	Lake opposite McDonald Point	0.30	0.08	0.15
7.	Lake opposite Driftwood Point	0.20	0.08	0.11
8.	Lake opposite Nigger Head	0.30	0.06	0.14
9.	Lake over Coeur d'Alene City Intake	0.38	0.05	0.15

Compiled from Tables Nos. 3 to 11, inclusive, of W. V. Leonard's Report

SPOKANE RIVER SURVEYS

Summarized from:

(1) "Preliminary Survey of the Pollution in the Spokane River at Spokane and Vicinity," August 1930, by Washington State Supervisor of Game and Game Fish S. F. Rathbun and Sanitary Engineer State Department of Health H. W. Nightingale;

(2) "The Sanitary Significance of Spokane River," by Spokane City Engineer A. D. Butler;

(3) "Spokane Washington Report on Sewage Disposal," July 1933 by Pearse, Greeley and Hansen, Consulting Engineers, Chicago, Ill.;

(4) Data assembled by Roy M. Harris, Washington State Department of Health, 1936 and 1937.

Prior to World War II the Spokane River was under observation for many years by several different agencies. The City of Spokane studied the river periodically from about 1921 to 1933. The Washington State Health Department and the Supervisor of Game and Game Fish cooperated in a preliminary survey during August 1930. An independent investigator, Dr. W. A. Buice, conducted bacteriological studies during 1936, and more complete studies during 1938. The State Department of Health again studied the biochemical and bacteriological characteristics of the river during 1936 and 1937. Greeley and Hansen, consulting engineers for the City of Spokane, made certain studies for sewage treatment facilities based on the survey data of the city engineer and others. Because none of these surveys was sufficiently comprehensive, and because of changed conditions since they were made, they do not adequately indicate the extent of pollutional damages to the Spokane River.

The City of Spokane has grown almost 50 percent in population, has installed a sewerage system serving 160,000 people, and gained more waste-producing industries since the August 1930 pollution survey of the Spokane River was made. Moreover, additional flow control facilities have been installed on the river.

Pertinent data from each survey are summarized as follows:

Preliminary Survey of the Pollution in the Spokane River at Spokane and Vicinity, August 1930

During this survey determinations of temperatures, dissolved oxygen, pH and plankton were made at stations located as follows:

Station No.	River Mile	Location
1	84	Irwin Bridge
2	79	City Power Plant Dam
3	71	Above Fort Wright Foot Bridge
4	67	Nine Miles above Nine Mile Dam
5	58	Nine Mile Dam

Following are results of the determinations with the exception of plankton which is separately reported:

Station No.	Temp. Degree C.	D.O. p.p.m.	D.O. % Sat.	pH
1	--	7.6	--	7.6
2	21.0	6.65	73.9	7.2
3	19.2	8.05	86.3	7.8
4	19.2	7.65	82.0	7.6
5 (Top)	19.0	5.7	61.1	7.3
5 (Bottom)	--	5.65	60.4	--

Plankton samples taken at stations numbers 2, 3, and 5, as well as a sample of the water containing the effluent of the sulphite mill, showed the presence of a variety of organic matter, both living and dead. The water at station 2 showed the presence of pulp fibers in suspension and spinners of various microscopic algae (diatoms) of the following genera: _Navicula_, _Nitzschia_, and _Synedra_. Other algae present were _Anabaena_ and _Scenedesmus_. At station 3 a few specimens of _Oscillatoria_, a blue-green algae; _Navicula_, a diatom; _Pediastrum_, a desmid; and _Anuraea_, an animal type, were found in relatively small numbers. Similar organisms were present at station 5. In addition to these low forms of life, a development of higher algae, also contributors to dissolved oxygen production, was in evidence.

City of Spokane Studies 1933

Weekly samples were taken of the river at the low-water period from June 6 to December 5. Determinations of five-day B.O.D. were as follows:

Location	5-Day B.O.D.
Forebay of City Power Plant above city	1.47
Head of Nine Mile Lake Backwaters	2.17
Above Nine Mile Lake Dam	1.93
Mouth of Spokane River	1.40

Further studies by the city indicating the time of flow in the river from the Monroe Street Dam to the mouth are illustrated in the attached chart.

Spokane, Washington, Report on Sewage Disposal, July 1933

Pertinent data summarized from this report are as follows:

(1) "The sewage of Spokane and its industries is somewhat stronger than the average. In addition to the human sewage pollution and that of the industries of the city, the pollution load on the river comprises the cleanings of cesspools which are dumped into the river and the upriver pollution from the paper mill and the population in the valley up to Coeur d'Alene. We estimate the population equivalent of this pollution load to be from 172,000 to 287,000, depending in a large measure upon the operation of the industries."

(2) "The minimum river flow for one day is 1130 c.f.s. and a flow of 1700 c.f.s. is not exceeded for 10 percent of the time. The time of flow to the Nine Mile Dam at 1700 c.f.s. is estimated to be 25 hours and to the Long Lake Dam to be about 36 days, both estimates being based on 50 percent displacement in the pools."

(3) "A number of river analyses have been made by the City Engineer. The minimum dissolved oxygen of record is 5.4 p.p.m. equivalent to 61.5 percent saturation. The number of bacteria counted on agar and the number of B. coli indicated by the analyses are at times higher than what are considered reasonable standards for safe water for bathing and recreation."

(4) "There is no question that the Spokane River is polluted below the city and sometimes objectionably so."

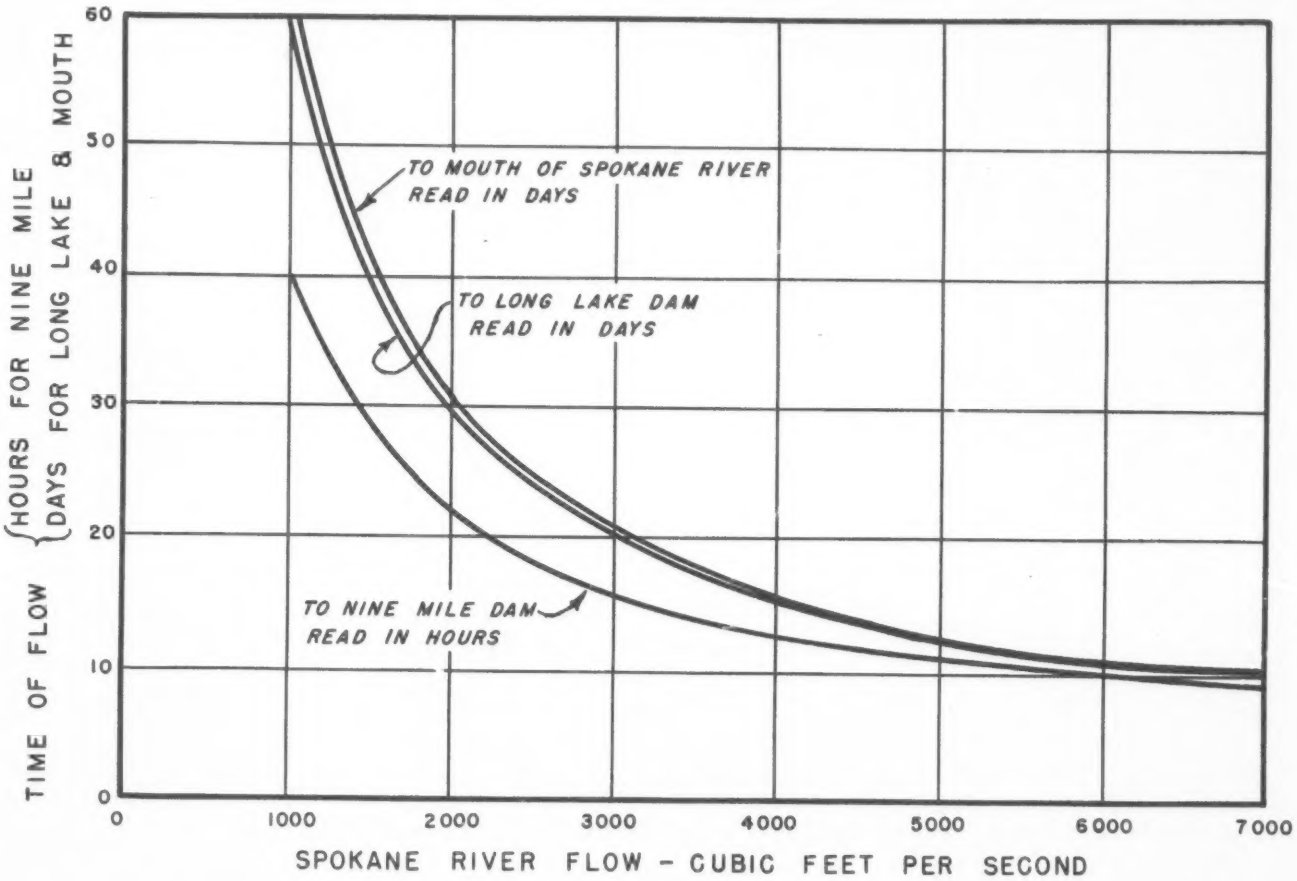
(5) "Below Spokane, based on a population equivalent of 200,000, the river provides a minimum flow of 5.7 c.f.s. and a 10 percent flow of 8.5 c.f.s. both per 1000 of this population; and in the future, if the city and industries grow, the dilution factor will be less."

(6) "It appears that the dissolved oxygen in the Spokane River in the pool above Nine Mile Dam is depleted to about the point indicated as a limit by the Tri-State Agreement of New York, New Jersey, and Connecticut, and by the Metropolitan Commission for New York Harbor, and may be occasionally below this figure."

(7) "The average number of B. coli in the Spokane River at the smelter prior to 1924 was found to be 2300 per 100 c.c. for the summer months and 2600 per 100 c.c. for all of the samples. Four out of 22 samples analyzed showed 10,000 B. coli per 100 c.c."

(8) "Sewage carries a considerable amount of floating material such as garbage, feces, toilet paper, soap and oil. Such substances tend to strand along the shore, in backwaters, behind logs and debris and in the quiet waters of pools. These strandings are unpleasant to see and mar the use of the water for recreation."

TIMES OF FLOW OF THE SPOKANE RIVER FROM MONROE STREET DAM



(9) "There is a considerable opportunity for the formation of sludge deposits in portions of the pools back of the dams at Nine Mile and Long Lake. It has been reported that when the Long Lake Pool was drained a few years ago the bottom deposits in the upper half of the lake showed evidence of sewage origin."

(10) "There is not enough river data to permit a complete or conclusive statement as to the effects of the sewage pollution upon the fish in the Spokane River. A number of observers stated that fishing below the City has been 'ruined'. The change by some was related to the construction of Nine Mile and Long Lake Dams. The characteristics of the river have, of course, been changed by the construction of dams and the pollution of the sewage. The natural plant and animal life in the waters has very likely been greatly changed."

Washington State Department of Health Studies 1936-1937

Surveys by the Washington State Department of Health were conducted during May, July, September, and November of 1936. In 1937 and 1938 additional samples were collected. Samples were collected at 21 stations along the Spokane River and determinations of biochemical and bacteriological characteristics made. Following are locations of principal sampling stations:

Station No.	River Mile	Location
1	99	Bridge at Post Falls, Idaho
2	99	Canal Intake, Post Falls, Idaho
3	94	Bridge near State Line
4	84	Bridge at Irwin
5	80	Forebay City Power Plant
6	69	Seven Mile State Park
7	63	Upper portion of Long Lake
8	53	Lower portion of Long Lake
9	41	Tail race of Long Lake Dam
10	16	Detillion Bridge

Results of the survey are averaged from 1 to 5 samples collected at each station for the biochemical tests and 3 samples for the bacteriological tests. They are summarized as follows:

	May			July			September		
Sta. No.	D.O. p.p.m.	5-Day B.O.D. p.p.m.	Number B. coli per 100 c.c.	D.O. p.p.m.	5-Day B.O.D. p.p.m.	Number B. coli per 100 c.c.	D.O. p.p.m.	5-Day B.O.D. p.p.m.	Number B. coli per 100 c.c.
1	--	--	--	7.8	0.9	0	--	--	-
2	--	--	--	7.7	0.8	8	--	--	-
3	11.0	2.3	100	7.7	0.6	4	9.1	0.8	2
4	10.7	2.7	33	8.2	0.6	4	--	--	-
5	--	--	--	7.7	1.7	340	9.0	1.4	3
6	11.3	3.2	3700	7.8	2.4	3700	--	--	-
7	--	--	--	--	--	--	8.1	2.0	-
8	11.3	2.1	100	8.8	1.5	0	--	--	-
9	10.2	2.2	6000	6.4	1.6	0	2.7	0.4	3
10	9.6	1.2	40	8.6	1.1	33	9.0	1.2	2

An average of 12 samples collected at the Seven Mile Bridge below Spokane during the month of November 1936 indicated the following: D.O. (p.p.m.) 10.5, 5-day B.O.D. 4.3, and a B. coli count of 23,500. These samples were collected in the morning and afternoon both at which time the water temperature was about 7 degrees C.

There were no significant variations in pH found during any of these tests. The usual range was from 7.2 to 8.4. Temperatures of the water were found to be from 10 to 17 degrees C. in May; 16 to 25 degrees C. in July; and 13 to 17 degrees C. in September.

Probably the best summary that has been made of Spokane River observations is contained in an article entitled "Report on Pollution of Spokane" prepared by Mr. Harris in December 1940 in connection with the joint investigations, Problem No. 26, Columbia Basin Irrigation Project. A copy of this report follows:

REPORT ON

POLLUTION OF SPOKANE RIVER

For

COLUMBIA BASIN IRRIGATION PROJECT
JOINT INVESTIGATIONS
Problem No. 26

Pollution of the Spokane River from domestic sewage and industrial wastes has been under observation for many years by several different agencies. The City of Spokane studied the river periodically from about 1921 to 1933. An independent investigator, the late Dr. W. A. Buice, conducted bacteriological studies during 1936, and more complete studies during 1938. The State Department of Health studied the biochemical and bacteriological characteristics of the river during 1936 and 1937. A summary of these three investigations was published in the February, 1937, issue of "Northwest Science" in the form of three articles by A. D. Butler, Spokane City Engineer, Dr. W. A. Buice, and Roy M. Harris. Certain important findings and conclusions of these three papers will be summarized for the information of the Committee.

Of first consideration, are the sources of pollution. These are as follows:

1. Millwood. At this location, just above Spokane, the Inland Empire Paper Mill discharges its sewage and, during a portion of the year, the mill wastes. The population equivalent of the entire output of the plant has been estimated as 115,000, based upon the biochemical oxygen demand of the wastes. During the summer months, however, the waste sulphite liquor has been used as a dust palliative on Spokane's city streets, and this has greatly reduced the pollution entering the river from this plant during periods of low flow. No estimate is available of the domestic population contributing sewage to the river at this point, but this is comparatively small.

2. City of Spokane. Spokane has approximately twenty-five subtrunk sewers entering the river at various places, and, in addition, there are numerous small industries along the river banks which discharge their wastes directly into the stream. The population equivalent of sewage contributed by the City of Spokane is estimated to be approximately 175,000, based upon the biochemical oxygen demand of the combined wastes.

3. Fort George Wright. At Fort George Wright sewage is discharged into the river, although at the present time an attempt is being made by the State Department of Health to have the army correct this condition.

The foregoing three sources are the only significant contributors to the pollution of the Spokane River. Prior to 1939, the City of Coeur d'Alene, in Idaho, discharged raw sewage into the Spokane River, but during 1939 their sewage treatment plant went into operation and this source of pollution has now been eliminated.

There are two fundamental recognized indices of measuring pollution: One is the biochemical oxygen demand of the stream, and the other is the B. coli index. The biochemical oxygen demand is a measure of the organic matter present in an unoxidized, or unstable, form. It is the measure of the putrescible matter present that will cause oxygen to be taken out of the water in the stream and used up for the purpose of oxidizing the contributed wastes. When the dissolved oxygen content of a stream is depleted to the point of exhaustion, the stream will be foul, offensive and unsightly. Fish life also will disappear in any water that is devoid of oxygen. If we use the B.O.D. of the Spokane River as an index of its quality, we find that the river has remarkable power of self-purification, due, of course, to its turbulent flow. At no sampling point on the river was it found that the dissolved oxygen content was below that necessary for the proper maintenance of fish life. We may conclude, therefore, that the Spokane River does not receive sufficient wastes to produce a nuisance, nor to produce conditions inimical to fish life, provided the dissolved oxygen or the B.O.D. of the water is used as an index.

If we next consider the importance of the public health aspect of a stream pollution problem, we must consider, primarily, the bacteriological quality of the water that may be used for drinking purposes or for recreational use. These B. coli indices indicate the relative number of fecal type organisms that are present in any water. When B. coli are ejected from the human body in the feces of man, they enjoy, first, a brief and rapid growth when in contact with the sewage laden waters. This growth then decreases rapidly in the form of a unimolecular type curve. The controlling factors governing the death rate of bacteria are time and temperature. These organisms have a tendency to survive longer in colder water than they do in warmer water. If time is the most important factor in the death rate of bacteria, it is extremely important to remember that the more swiftly the stream flows, the greater will be the distance over which bacteria will be distributed. It is important to bear this fact in mind, because of the age-old fallacy that "A flowing stream purifies itself." As a means of establishing the relative degrees of bacterial pollution in the river, it might be mentioned that any sample taken from a drinking water supply must show the total absence of B. coli to be considered as meeting the standards for purity of the U. S. Public Health Service. Also when sewage is known to be present, any water containing 10 or more B. coli per 100 c.c.'s is deemed to be unsatisfactory for natural swimming waters.

In Doctor Buice's study, samples were taken at four locations: One, above Millwood, the second, at Seven-Mile Bridge below Spokane, the third, on the Spokane River at Lincoln, and the fourth, on the Columbia River just above the junction of the Spokane River. The average B. coli index from May to November, 1936, for these four stations is as follows: Millwood, 70; Seven-Mile Bridge, 6,000; Lincoln, 170; Columbia River above junction, 8. These values, of course, show a high increase due to Spokane's sewage and also indicate a gradual decreasing of the B. coli organisms due to self-purification of the river down to the mouth of the Spokane River. They also indicate that the Columbia River above the junction is comparatively free from fecal type organisms. These values also indicate that the City of Spokane adds about eighty-five times as much sewage to the river as is contained in the stream when it enters the city from the east. It will also be noted that the concentration of B. coli organisms in the Spokane River near its mouth is about twenty-two times as great as in the Columbia River upstream from the junction of the two. Again, it will be noted that more sewage reaches Lincoln near the mouth of the Spokane River than enters the City of Spokane. To quote from Doctor Buice's paper, "Comparing the averages of the second and third stations, it appears that approximately one thirty-fifth of the coli aerogenes (B. coli) in Spokan's sewage reach the Columbia River. It is well-known that the members of this group and the typhoid bacterium compare very favorably in their capacities to resist the unfavorable living conditions outside the human intestine. Therefore, we may justly infer that some of the typhoid organisms which find their way into Spokane's sewerage system must ultimately reach the Columbia River. In other words, theoretically, at least, there is a potential danger of Spokane's sewage carrying typhoid to swimmers and the thirsty as far as the confluence with the Columbia."

The State Department of Health, in their studies that were made during 1936, established a number of stations below the City of Spokane and on the Columbia River, as well as some control stations above the City of Spokane. For the purposes of this condensed report, a comparison of a station at the Upriver Pumping Plant (near the upper city limits) with that at the Seven-Mile Bridge will be made. In addition, another comparison between a station at Gerome on the Columbia River and at Coulee Dam will be included. Bacteriological results for these two sets of stations were treated according to mathematical probability studies and plotted on logarithmic probability paper. From the curve representing these data, the following values are obtained:

(a) For twenty-five per cent of the time, the Upriver station will probably exceed 22,000 B. coli per 100 c.c.'s.

(b) For fifty per cent of the time, the Upriver station will probably exceed 8 B. coli per 100 c.c.'s; the Seven-Mile station will probably exceed 7,000 B. coli per 100 c.c.'s.

(c) For seventy-five per cent of the time, the Upriver station will probably exceed 5 B. coli per 100 c.c.'s; the Seven-Mile station will probably exceed 1,500 B. coli per 100 c.c.'s.

This tremendous increase in the coli index indicates the influence of sewage from the City of Spokane on the Spokane River.

Another interesting comparison is between the Columbia River stations at Gerome, above the mouth of the Spokane River, and at Coulee Dam. For these two stations the comparison is as follows:

(a) For twenty-five per cent of the time, Gerome will probably exceed 8 B. coli per 100 c.c.'s; Coulee Dam will probably exceed 38 B. coli per 100 c.c.'s.

(b) For fifty per cent of the time, Gerome will probably exceed 4 B. coli per 100 c.c.'s; Coulee Dam will probably exceed 13 B. coli per 100 c.c.'s.

(c) Seventy-five per cent of the time Gerome will probably exceed 1.5 B. coli per 100 c.c.'s; Coulee Dam will probably exceed 4.5 B. coli per 100 c.c.'s.

From the above tabulation, it may be concluded that the Columbia River at Gerome is relatively free from harmful pollution. By the same token, it may be inferred that the sewage from the City of Spokane, which is contributed to the Spokane River, is to some extent reaching as far as Coulee Dam during periods of normal river flow. This does not necessarily mean that the water at Coulee Dam is highly polluted for it is relatively clean compared with the more polluted waters in the Spokane River; but it does indicate that there is some influence of Spokane's sewage felt this far downstream from the mouth of the Spokane River.

The State Department of Health has for many years considered the Spokane River below the City of Spokane to be unsafe for recreational use. It is recognized fact that this river is widely used for recreational purposes in spite of the fact that raw sewage is being discharged into this stream. For these reasons, the State Department of Health has repeatedly recommended and urged that the City of Spokane construct adequate intercepting and trunk sewers and satisfactory sewage treatment plants to eliminate the present harmful pollution from the river.

The city officials of Spokane were aware of their responsibility in this respect and submitted a bond issue to the voters on November 21, 1933, for the purpose of providing funds for intercepting sewers and sewage treatment plants. Because of adverse newspaper policy, the bond issue was defeated. Again on March 10, 1936, the City Commissioners submitted a proposal to the voters for authority to construct trunk and intercepting sewers and a sewage treatment plant; and, as before, adverse newspaper policy resulted in defeat of this bond issue. During the latter part of 1939, another attempt was made to secure funds from one department to enable the City of Spokane to construct the northside intercepting sewer, but this proposal was again referred to the people and, subsequently, defeated.

The State Department of Health has, according to our basic statutes, the power to order the City of Spokane to construct adequate sewage treatment facilities. However, if the expenditures for such facilities involve a bond issue, this proposal must be submitted to the voters, and, if rejected by the voters, the Department of Health is powerless to enforce their order. Contempt proceedings could probably be instituted against the city officials, but this would not effect a solution to the problem. If public sentiment was not so warned against sewage treatment by Spokane's leading newspapers, it seems logical to believe that the citizens of that city would realize the importance of cleaning up the river and the moral obligation that they have for preventing the spread of their own filth to the extended areas below the city.

CONCLUSIONS

(1) Considerable data has been collected on the effect of Spokane's sewage on the Spokane River.

(2) As measured in terms of the biochemical oxygen demand of the river water itself and of the dissolved oxygen content of the water, the Spokane River is not in a putrescible state and not likely to produce a common nuisance. Also, there is sufficient oxygen available to support fish life.

(3) Bacteriological studies indicate that pollution arising from Spokane's sewage is detrimental to the public health if these waters are used for recreational purposes, particularly swimming and occasional drinking.

(4) Plans for sewage treatment plants and intercepting sewers have been considered by the voters of Spokane but have been rejected because of adverse newspaper policy.

(5) Correction of this pollution problem and the subsequent reclamation of the Spokane River for recreational use can be effected if the citizens of Spokane are made to understand their moral responsibility in this regard. This will probably only be accomplished through the leadership of influential groups, such as Chambers of Commerce and other similar organizations.

REPORTS ON
THE RELATIONSHIP OF SPOKANE RIVER TO
SPOKANE WATER SUPPLY--1939
AND
SPOKANE COUNTY EPIDEMIOLOGICAL DATA
1937 - 1942

The relationship between high flows in the Spokane River and the density of coliform-Aerogenes bacteria in water being pumped at the Spokane Upriver pumping plant is shown on Plate 1.

Plate 2 shows death rates from all enteric diseases, diarrhea and enteritis, typhoid fever, and dysentery as recorded by Spokane County and the State of Washington Health Departments.

72-A

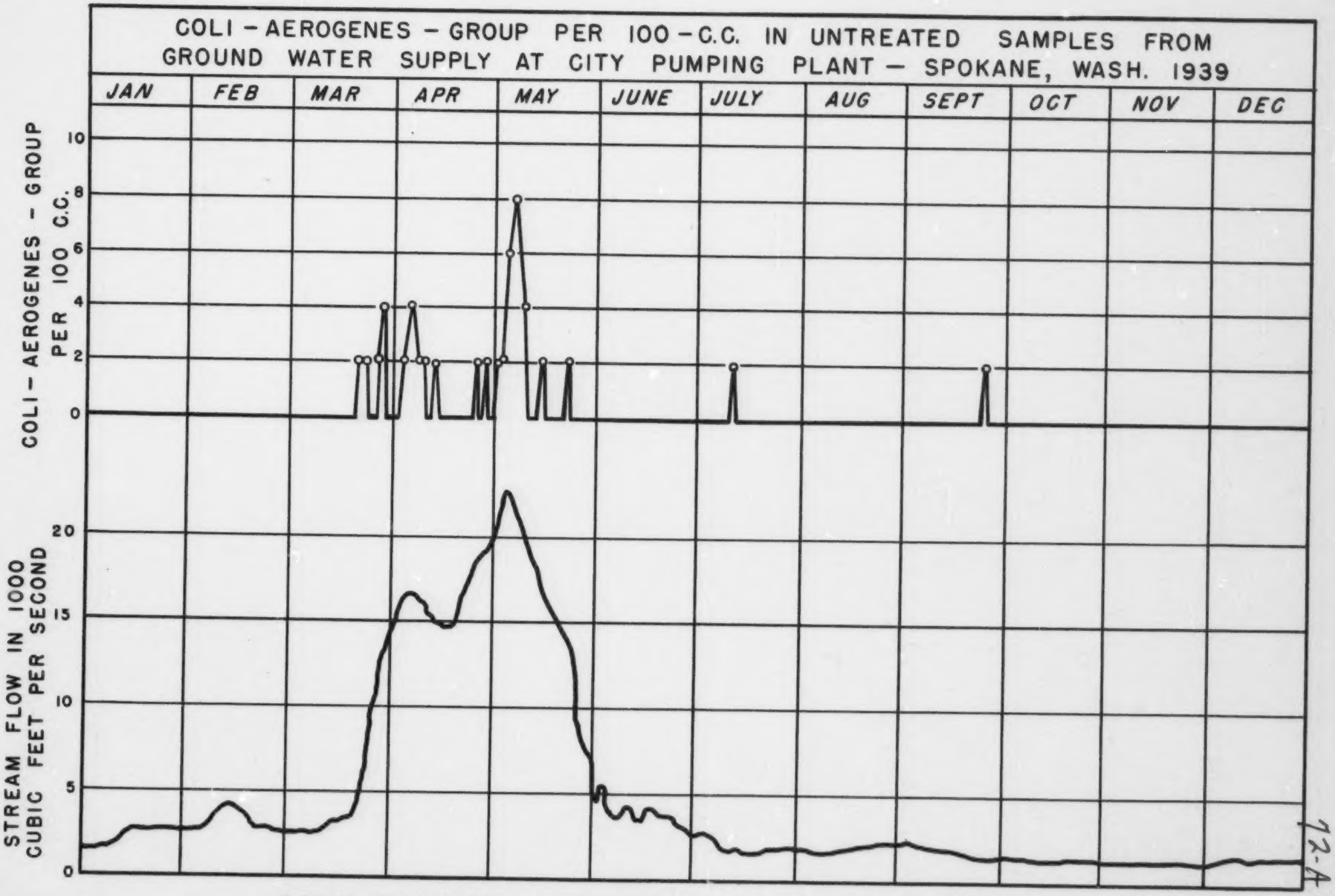

COLI - AEROGENES - GROUP PER 100 - C.C. IN UNTREATED SAMPLES FROM GROUND WATER SUPPLY AT CITY PUMPING PLANT - SPOKANE, WASH. 1939

PLATE NO. 1

DAILY DISCHARGE OF SPOKANE RIVER AT SPOKANE - 1939

Source;
Report on relationship of Spokane River to Spokane water supply.
By Alex Lindsay superintendent of water, Spokane Wash. Dec. 15, 1942.

DEATH RATES FROM ALL ENTERIC DISEASES, DIARRHEA AND ENTERITIS, – TYPHOID FEVER AND DYSENTERY

PER HUNDRED THOUSANDS POPULATION

SPOKANE COUNTY AND THE STATE OF WASHINGTON

SIX YEAR AVERAGE 1937 – 1942

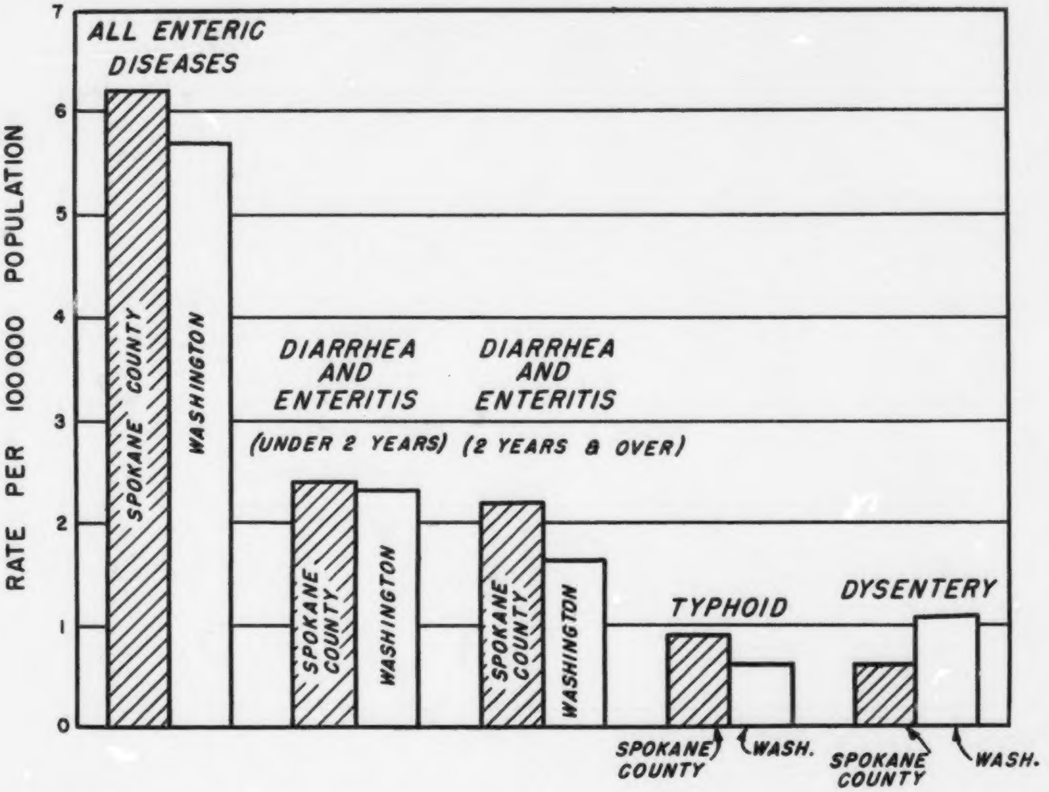


PLATE NO. 2

SPOKANE RIVER SURVEYS 1950

Summarized from preliminary reports of G. T. Orlob, Survey Engineer, and Walter W. Saxton, District Engineer, Washington State Pollution Control Commission.

This survey was started in April 1950 in order to determine the amount of pollution entering Lake Franklin D. Roosevelt. Fifteen stations were selected for sampling during the high flow and low flow periods in the Spokane River. The first samples were collected on April 25, 1950, while flow in the river was high, about 24,000 c.f.s., and consisted of one sample each for bacteriological and biochemical analyses at each station.

Bacteriological Tests -- April 25, 1950

Sta. No.	River Mile	Location	Coliform M.P.N./100 c.c.
1	92.5	Spokane Bridge	23
2	81.5	Bridge below Trentwood Rolling Mill	60
3	79.3	Argonne Bridge at Millwood	230
4	79.0	Upriver Dam	230
5	75.0	Green St. Bridge	230
6	73.7	Mission Ave. Bridge	230
7	71.8	Division St. Bridge	2400
8	71.2	W.W.P. Forebay Post and Monroe	2400
9	67.0	Ft. Wright Bridge	2400
10	64.0	Bowl and Pitcher Bridge	13000
11	59.5	Seven Mile Bridge	6200
12	56.0	Nine Mile Bridge	6200
13	27.0	Little Falls Dam	620
14	1.5	Miles Bridge	620

Biochemical Tests -- April 25, 1950

Sta. No.	D.O. p.p.m.	Temp. Degree C.	5-Day D.O. 24° C. p.p.m.	5-Day B.O.D. p.p.m.	D.O. (Percent Saturation)
1	12.6	5.5	9.1	3.5	100
2	12.6	5.5	9.3	3.3	100
3	12.6	5.5	10.8	1.8	100
4	12.6	5.5	9.4	3.2	100
5	12.6	5.5	11.4	1.2	100
6	12.6	5.5	9.6	3.0	100
7	12.6	5.5	10.0	2.6	100
8	13.5	5.5	11.0	2.5	108
9	14.5	5.5	10.0	4.5	116
10	14.3	6.0	10.0	4.3	115
11	14.0	6.5	10.2	3.8	114
12	13.8	6.0	9.8	4.0	111
13	14.1	7.0	9.9	4.2	116
14	12.9	8.0	9.0	3.9	109

COPY COPY

STATE OF WASHINGTON
POLLUTION CONTROL COMMISSION
423 HUTTON BUILDING
SPOKANE, WASHINGTON

MEMORANDUM

August 24, 1950

TO: MR. E. F. ELDRIDGE

FROM: Walter W. Saxton

SUBJECT: Results of Spokane River Survey

Attached are the results of the Spokane River Survey conducted August 16, 1950, by Roger James, District Engineer for the Washington State Department of Health; Ken Jones, Industrial Survey Engineer from our Olympia office, and myself.

BOD's were incubated without the aid of a controlled, 20°C incubation cabinet. They were incubated in a water-seal tank at room temperature. The water temperature in the tank was checked daily and remained at 26°C ± 1°. The low value of the BOD's makes the temperature correction negligible.

Bacteriological sampling was accomplished with sterile bottles and a dissolved oxygen sampler. Samples were set up in two series of four tubes each and were made at each sampling point with inocculations of 1 milliliter of each of the following dilutions of the original sample per tube:

Tubes 1 & 2 - Full strength
" 3 & 4 - 1:10 dilution
" 5 & 6 - 1:100 dilution
" 7 & 8 - 1:1000 dilution.

Results are expressed as the average of the indicated MPN of the two series.

The river mile is computed in accordance with the general practice of starting with 0.0 miles at the river's mouth. The river miles for the April survey were recorded in inverse order with 0.0 mile being at the outlet of Lake Coeur d'Alene. A correction of 1.5 miles is required as the Miles Bridge is 1.5 miles above the actual confluence of the Spokane and Columbia Rivers (Lake Roosevelt).

WWS:JS

/s/ Walter W. Saxton

SPOKANE RIVER SURVEY
August 16, 1950

No.	Station	River Mile	D. O. Initial	D. O. 5-day	BOD	Temp. C°	MPN
1	Spokane Bridge	92.5	8.6	7.2	1.4	22°	230
2	Trent Ave. Bridge (Trentwood)	81.5	9.0	7.0	2.0	17°	0
3	Argonne Bridge (Millwood)	79.3	9.3	6.7	2.6	16.5°	230
4	Green Street Bridge	75.0	8.6	6.0	2.6	16.5°	6,900
5	Mission Street Bridge	73.7	8.9	6.2	2.7	16.5°	620
6	Division Street Bridge	71.3	9.3	4.8	4.5	17.5°	24,000
7	Wash. Street Bridge (So. Channel)	71.55	9.1	4.7	4.4	17°	69,000
8	Howard St. Bridge (So. Channel)	71.4	9.2	4.9	4.3	17°	69,000
9	W.W.P.Co. intake below Post St. Bridge	71.2	9.0	4.6	4.4	17°	24,000
10	Fort Wright Bridge	67.0	9.8	4.4	5.4	18°	69,000
11	Bowl & Pitcher Bridge	64.0	10.7	5.0	5.7	18.5°	69,000
12	7-Mile Bridge	59.5	10.0	5.0	5.0	19°	24,000
13	9-Mile Dam	56.0	10.6	3.7	6.9	19.5°	6,900
14	Long Lake Dam	32.5	4.8	2.6	2.2	18.5°	60
15	Little Falls Dam	27.0	5.4	3.4	2.0	16.5°	60
16	Miles Bridge	1.5	9.9	7.6	2.3	17°	60

SPOKANE RIVER SURVEY

October 10, 1950

(Stations listed in order, going downstream)

Station	River Mile	D.O.	Temp. Deg.C.	MPN	Weather
Spokane Bridge	92.5	9.4	13.	230	Windy
Trent Ave. Bridge	81.5	9.2	12.	0	Windy
Argonne Bridge	79.3	9.3	12.	230	Windy
Green St. Bridge	75.0	9.0	12.	2,300	Windy
Mission St. Bridge	73.7	9.2	12.	2,300	Strong S.W. Wind
Division St. Bridge	71.8	9.1	12.	69,000	Strong S.W. Wind
Wash. Street Bridge (So. channel)	71.55	8.8	12.5	69,000	
Howard St. Bridge (So. channel)	71.4	8.8	12.5	24,000	
Post Street	71.2	8.6	12.0	69,000	
Ft. Wright Bridge	67.0	9.2	13.0	69,000	
Bowl & Pitcher Foot Bridge	64.0	9.4	12.5	24,000	
7-Mile Bridge	59.5	9.4	12.5	24,000	
9-Mile Dam	56.0	8.6	12.5	69,000	
Long Lake Dam	32.5	7.6	15.0	230	
Little Falls Dam	27.0	6.6	14.5	60	
Miles Bridge	1.5	8.6	17.0	60	

CITY OF SPOKANE -- WATERWORKS

May 1, 1951

Description

Spokane obtains its water from dug wells which tap an underground stream flowing through the glacial gravel of the Spokane Valley. The source of the water is apparently the watersheds of the rivers and lakes of Northern Idaho and Western Montana. The supply, which has been estimated at 1,000 second feet, is more than adequate for all present requirements. The depth to water is from 40 to 300 feet, and in most cases the water rises in the wells when it is tapped. The water seems to be reasonably safe from human contamination, and maintains a constant temperature of 48 degrees Fahrenheit. The ground water is diverted northwards by the rock formation which creates the falls in the center of Spokane. The main pumping stations are located near the central section of the eastern boundary of the city and, consequently, there are no long supply lines required.

Area Supplied

The Spokane Waterworks supplies the entire City of Spokane and has only approximately 100 services outside the city limits.

Water Requirements

Water is supplied directly through 44,800 services, including 3,582 commercial and industrial supplies. Total population served is approximately 168,000. Due to the ease of obtaining water, many industries within the city have private sources of supply. Present water demands are listed below.

(a)	Average daily	53.2 m.g.d.
(b)	Maximum daily	113.6 m.g.d.
(c)	Average day maximum month (July)	85.5 m.g.d.
(d)	Average day, July, August, September	77.2 m.g.d.

Water Rates

Residential rates are based on a minimum charge of $0.75 for the first 833 cu. ft. or part thereof, and a charge of $0.09 for each additional 100 cu. ft.

Commercial and industrial rates for services supplied with lines of one inch or less are based on a minimum charge of $1.00 for the first 1111 cu. ft. or part thereof, and a charge of $0.09 for each additional 100 cu. ft. up to 150,000 cu. ft., and $0.07 for all water over 150,000 cu. ft. The $0.07 rate applies only to low pressure service. For services larger than one inch, minimum charges of from $2.00 for a 1-1/2 inch service to $25.00 for a 10-inch service are made with corresponding minimum allowances of from 2222 cu. ft. to 27,777 cu. ft.

Special rates are made to religious institutions, and other public and private social organizations, as well as for fire protection purposes.

All services are metered.

Water Quality and Treatment

The following is a chemical analysis of the water supplied from the Upriver wells, dated 1/3/49:

	Parts Per Million
Calcium (Ca)	33.0
Magnesium (Mg)	14.6
Sodium (Na)	6.7
Bicarbonate (HCO_3)	175.0
Carbonate (CO_3)	0.0
Sulfate (SO_4)	8.4
Chloride (Cl)	3.5
Silica (SiO_2)	29.0
Alumina (Al_2O_3)	0.0
Iron (Fe_2O_3)	0.0
Alkalinity, phenolphthalein (as $CaCO_3$)	0.0
Alkalinity, methyl orange (as $CaCO_3$)	144.0
Hardness (as $CaCO_3$)	142.5
Total Solids	172.0
Mineral matter	104.0
Volatile matter	68.0
Dissolved oxygen	9.0
Carbon Dioxide (CO_2)	4.0
Fluorine (F)	0.03
Nitrate Nitrogen (NO_3-N)	0.5
Manganese	0.0
pH	7.9
Turbidity	0.0

The only treatment is the addition of chlorine by means of 22 Wallace and Tiernan, Type SASV, chlorinators. The residual at the tap is maintained at 0.1 p.p.m. for most of the year and at 0.15 p.p.m. during times of high flow in the Spokane River as a precautionary measure.

Supply Facilities

Water is supplied almost directly to the distribution system from the following wells which are listed with their respective pumping capacities.

Pumping Station		Capacity m.g.d.
Upriver	Wells #1 to 5	128.0
Parkwater	Wells #11 to 18	90.0
Ray Street	Wells #6, 7, and 19	30.0
Grace Avenue	Wells #20 and 21	28.0
Hoffman Avenue	Wells #8 and 9	16.0
Baxter	Wells #22 and 23	2.0
Indian Canyon	Well #10	.72
	Total	294.72

Several main pipelines varying from 24 inch to 48 inch diameter lead from the pumping stations to the main reservoirs. These mains also act as distribution mains, and are included as such in the distribution figures shown below.

Power for the Upriver and Parkwater pumping stations is generated at a hydroelectric plant belonging to the Water Department. This accounts for approximately 75 percent of the power needed for pumping and helps considerably in maintaining the very low water rates charged in Spokane. The hydroelectric plant and dam on the Spokane River are located at the Upriver Pumping Station and, being completely automatic in operation, require very little attention and deliver very cheap power.

Distribution Facilities

The distribution system contains three large open reservoirs, one covered reservoir, and seven standpipes which are listed below together with their capacities.

Reservoir	Capacity Million Gallons
Ninth and Pine -- Open	17.5
Lincoln Heights -- Open	24.0
North Hill -- Open	15.0
Rockwood Vista -- Covered	11.0
Standpipes (One -- 1.25 m.g. Four --.35 m.g. One -- .20 m.g. -- Covered One -- .10 m.g. -- Covered)	2.95
Total	70.45

The distribution mains vary from 4 inches to 48 inches in diameter and are fully adequate for fire protection in most areas. In all there are some 550 miles of mains, 50 percent of which are cast iron and 50 percent steel.

Construction Underway

Normal main extensions costing $225,000 are expected to be made during the present fiscal year, together with a further $150,000 for normal replacements. The main project underway at present is the provision of a new 30 and 36 inch main extending for 12,000 feet in the northern section of the city.

Construction Planned

1. An expenditure over and above normal requirements of $150,000 (approximately) for large main extensions to suburban areas.
2. Two 300 h.p. booster pumps at Lincoln Heights.
3. A new one million gallon storage reservoir.

TABLE 1 -- BASIC DATA ON SOURCES OF MUNICIPAL* POLLUTION

SPOKANE RIVER BASIN

Name and Location	Miles Above Mouth	Sewered Population	Untreated Waste1/ (P.E.)	Treatment Provided2/	Adequacy of Treatment Facilities3/		Pollution to Water-Course (P.E.)	Treatment Needs4/	Project Status
					Cap'y.	Opr.			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
IDAHO									
ST. JOE RIVER -- Spokane 130									
Avery	55	210	210	N	---	---	210	NP	Inactive
St. Maries	15	2,000	2,100	N	---	---	2,100	NP	Inactive
SOUTH FORK COEUR D'ALENE RIVER -- Coeur d'Alene 40									
Mullan	24	2,000	2,000	N	---	---	2,000	NP	Inactive
Wallace	17	3,100	3,100	N	---	---	3,100	NP	Inactive
Silverton	15	400	400	N	---	---	400	NP	Inactive
Wardner	7-2	---	750	N	---	---	750	NP	Inactive
Kellogg	6	4,000	4,100	N	---	---	4,100	NP	Inactive

* Includes incorporated or unincorporated municipalities, military establishments, and other population centers.

1/ Includes industrial wastes discharged into municipal sewerage systems.

2/ N = None; M = Minor; P = Primary; S = Secondary.

3/ S = Satisfactory; Uns = Unsatisfactory; Un = Undetermined.

4/ NP = New Plant; A = Addition; C = Connect to Municipal Sewer; Un = Undetermined; --- = No Project Required.

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TABLE 1 -- BASIC DATA ON SOURCES OF MUNICIPAL POLLUTION -- Page 2
SPOKANE RIVER BASIN

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
CANYON CREEK -- S.F. Coeur d'Alene 17									
Burke	6	---	550	N	---	---	550	NP	Inactive
Mace	5	---	400	N	---	---	400	NP	Inactive
Gem	3	---	450	N	---	---	450	NP	Inactive
COEUR D'ALENE LAKE -- Spokane 105									
Harrison	---	40	40	N	---	---	40	NP	Inactive
SPOKANE RIVER MAIN STEM -- Columbia 640									
Coeur d'Alene	106	9,000	9,000	S	S	S	1,300	---	---
Sub-totals		20,750	23,100				15,400		
WASHINGTON									
SPOKANE RIVER MAIN STEM -- Columbia 640									
Velox Naval Supply Depot	85	Variable	Variable	S	S	S	Variable	---	---
Millwood	81	180	180	N	---	---	180	NP	Inactive
Spokane	71-77	160,000	197,500	N	---	---	197,500	NP	Under Construction*

* Interceptors under construction.

TABLE 1 - BASIC DATA ON SOURCES OF MUNICIPAL POLLUTION -- Page 3
SPOKANE RIVER BASIN.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
SPOKANE RIVER MAIN STEM (CONT.)									
Geiger Field	71	Variable	Variable	N	---	---	Variable	C	Inactive
Fort George Wright	71	Variable	Variable	N	---	---	Variable	C	Inactive
Fairchild Air Force Base	71	Variable	Variable	S	S	S	0	---	---
LITTLE SPOKANE RIVER -- Spokane 58									
Deer Park	25	1,200	1,200	S	S	S	200	---	---
LATAH CREEK -- Spokane 71									
Tekoa	41	1,200	1,200	I	S	S	360	---	---
Fairfield	22-5	300	300	S	S	S	0	---	---
Cheney	16	3,300	3,300	P	Uns	S	2,500	A	Inactive
Sub-totals		166,180	203,680				200,740		
GRAND TOTAL		186,930	226,780				216,140		

TABLE 2 -- BASIC DATA FOR SOURCES OF INDUSTRIAL* POLLUTION

SPOKANE RIVER BASIN

Name and Location	Miles Above Mouth	Type Industry	Type of Waste Produced 1/	Treatment or Other Pollution Control Measures			P.E. (B.O.D.) Discharged to Water-Course4/	Pollution Abatement Need5/	Current Status Industrial Action
				Degree2/	Adequacy3/				
					Cap'y.	Opr.			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
IDAHO									
COEUR D'ALENE RIVER -- Spokane 125									
PRICHARD CREEK -- Coeur d'Alene 62									
EAGLE CREEK -- Prichard Creek 5									
Jack Waite Mining Co., Prichard	10	Mining & Ore Concentration	Ino	P	Un	Un	---	Un	Undetermined

* Industries having separate outlets and discharging wastes directly to watercourse.

1/ O = Organic; Ino = Inorganic; S = Sanitary Sewage Only; Un = Undetermined.

2/ N = None; M = Minor; P = Primary or equivalent; S = Secondary or equivalent; Un = Undetermined.

3/ S = Satisfactory; Uns = Unsatisfactory; Un = Undetermined.

4/ Un = Undetermined.

5/ --- = No Project; NP = New Plant or other pollution control measures; C = Connection to municipal system; Un = Undetermined.

TABLE 2 -- BASIC DATA FOR SOURCES OF INDUSTRIAL POLLUTION — Page 2
SPOKANE RIVER BASIN

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
IDAHO (Cont.)									
BEAVER CREEK — Coeur d'Alene 60									
Day Mines, Inc., Monitor Mining Co. (See Map 9)	10	Mining & Ore Concentration	Ino	P	Un	Un	—	Un	Undetermined
SOUTH FORK COEUR D'ALENE RIVER – Coeur d'Alene 40									
Federal Mining & Smelting Co., Morning Group, Mullan	23	Mining & Ore Concentration	Ino	N	—	—	—	Un	Undetermined
Golconda Lead Mines, Mullan	22	"	Ino	N	—	—	—	Un	"
Galena Mining Co., Wallace	16	"	Ino	N	—	—	—	Un	"
Coeur d'Alene Mines Corp., Wallace	14	"	Ino	N	—	—	—	Un	"
Polaris Mining Co., Wallace	12	"	Ino	N	—	—	—	Un	"
Sunshine Mining Co., Kellogg	10	"	Ino	N	—	—	—	Un	"
Bunker Hill & Sullivan Mining & Concentrating Co., Kellogg	6	Primary Metal	Ino	P	Un	Un	—	Un	"
Bunker Hill & Sullivan Mining & Concentrating Co. Smelter, Kellogg	6	"	Ino	P	Un	Un	—	Un	"

TABLE 2 -- BASIC DATA FOR SOURCES OF INDUSTRIAL POLLUTION -- Page 3
SPOKANE RIVER BASIN

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
IDAHO (Cont.) S.F. COEUR D'ALENE RIVER (Cont.)									
Federal Mining & Smelting Co., Page Group, Kellogg	4	Mining & Ore Concentration	Ino	P	Un	Un	---	Un	Undetermined
CANYON CREEK -- SF Coeur d'Alene 17									
Day Mines, Inc., Hercules Mining Co., Burke	8	Mining & Ore Concentration	Ino	N	---	---	---	Un	Undetermined
Day Mines, Inc., Sherman Lead Co., Burke	8	"	Ino	N	---	---	---	Un	"
Hecla Mining Co., Star Mine & Mill, Burke	8	"	Ino	N	---	---	---	Un	"
Day Mines Inc., Tamarack & Custer Consolidated Mining Co., Dorn	6	"	Ino	N	---	---	---	Un	"
NINE MILE CREEK -- SF Coeur d'Alene 16½									
Zanetti Mining & Milling Co., Rex Mill, (See Map 9)	8	Mining & Ore Concentration	Ino	N	---	---	---	Un	Undetermined
Day Mines Inc., Dayrock Mining Co., Wallace	6	"	Ino	M	Un	Un	---	Un	"

TABLE 2 -- BASIC DATA FOR SOURCES OF INDUSTRIAL POLLUTION -- Page 4
SPOKANE RIVER BASIN

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
IDAHO (Cont.) NINE MILE CREEK (Cont.)									
Wallace Meat Co., Wallace	4	Meat Products	0	N	---	---	Un	Un	Undetermined
MILO CREEK —SF Coeur d'Alene 7									
Bunker Hill & Sullivan Mining & Concentrating Co., John-George Mill, Wardner	2	Mining & Ore Concentration	Ino	Un	---	---	---	Un	Undetermined
PINE CREEK — SF Coeur d'Alene 2									
Amy Silver-Lead Co., Kellogg	4	Mining & Ore Concentration	Ino	N	---	---	---	Un	Undetermined
Nabob Silver-Lead Co., Kellogg	4½	"	Ino	N	---	---	---	Un	"
EAST FORK PINE CREEK -- Pine Creek 4½									
Mascot Mining Co., Denver Mill, Pine Creek	1	Mining & Ore Concentration	Ino	N	---	---	---	Un	Undetermined
Sunset Minerals, Inc., Kellogg	2	"	Ino	N	---	---	---	Un	"
Highland Surprise Consolidated Mining Co., Kellogg	2½	"	Ino	N	---	---	---	Un	"
Sidney Mining Co., Kellogg	3	"	Ino	N	---	---	---	Un	"

TABLE 2 -- BASIC DATA FOR SOURCES OF INDUSTRIAL POLLUTION -- Page 5
SPOKANE RIVER BASIN

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
IDAHO (Cont.)									
WEST FORK PINE CREEK -- Pine Creek 4½									
Spokane-Idaho Mining Co., Kellogg	2	Mining & Ore Concentration	Ino	N	---	---	---	Un	Undetermined
WASHINGTON									
SPOKANE R., MAIN STEM -- Columbia 640									
Miller Bros., Greenacres	90	Canning & Preserving	0	S	S	S	0	---	---
Spokane Valley Canning Co., Vera	88	"	0	S	S	S	0	---	---
Royal Canning Co., Vera	88	"	0	S	S	S	0	---	---
Early Dawn Dairy, Vera	88	Milk Products	0	S	S	S	0	---	---
Chas.M. Rice & Son., Vera	88	Meat Products	0	S	S	S	0	---	---
Kaiser Aluminum & Chemical Corporation, Trentwood	85	Primary Metal	Ino S	S S	S S	S S	--- 250	--- ---	--- ---

TABLE 2 -- BASIC DATA FOR SOURCES OF INDUSTRIAL POLLUTION -- Page 6
SPOKANE RIVER BASIN

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
WASHINGTON (Cont.) SPOKANE R., MAIN STEM (Cont.)									
Valley Cash Market, Opportunity	84-2	Meat Products	0	S	S	S	0	---	---
Valley Creamery, Dishman	82-2	Milk Products	0	S	S	S	0	---	---
Inland Empire Paper Co., Millwood	81	Pulp & Paper Products	0	N	---	---	130,000	NP	Inactive
Swift & Co., Spokane	66-77	Meat Products	0	M	Uns	Uns	10,000	NP	Active Planning
Liberty Dairy, Spokane	66-77	Milk Products	0	N	---	---	20	Un	Undetermined
Sicks' Spokane Brewery, Spokane	66-77	Brewery	0	N	---	---	12,000	C	Inactive
Acme Sand & Gravel Co., Spokane	66-77	Other Mining	Ino	N	---	---	---	NP	Active Planning
Union Sand & Gravel, Spokane	66-77	Other Mining	Ino	N	---	---	---	NP	Inactive
Culligan Soft Water Service, Spokane	66-77	Chemicals & Allied Prod.	Ino	N	---	---	---	---	---
Crystal Laundry Co., Spokane	66-77	Laundry	0	N	---	---	800	C	Inactive
Spokane Toilet Supply Co., Spokane	66-77	Laundry	0	N	---	---	1,200	C	Inactive
Spokane Flour Mills, Spokane	66-77	Grain Products	0	N	---	---	1,000	C	"
Armour & Co., Spokane	66-77	Meat Products	0	M	Uns	S	29,000	NP	"

TABLE 2 -- BASIC DATA FOR SOURCES OF INDUSTRIAL POLLUTION -- Page 7
SPOKANE RIVER BASIN

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
WASHINGTON (Cont.)									
SPOKANE RIVER, MAIN STEM (Cont.)									
Spokane Rendering Co., Spokane	66-77	Meat Products	0	N	---	---	Un	NP	Inactive
United Creamery, Spokane	66-77	Milk Products	0	N	---	---	190	C	Under Construction
LITTLE SPOKANE RIVER -- Spokane 58									
Deer Park Pine Industries, Deer Park	25	Lumber & Wood Products	0	Un	---	---	Un	Un	Undetermined
Kaiser Aluminum & Chemical Corp., Mead	10	Primary Metal	Ino S	P S	S S	S S	--- 100	--- ---	--- ---
Pacific Northwest Alloys, Mead	10	Primary Metal	Ino S	S S	S S	S S	0 0	--- ---	--- ---
Subtotal							184,560		
GRAND TOTAL							184,560		

TABLE 3
SPOKANE BASIN DRAINAGE AREAS

Drainage Area	Square Miles
Spokane River:	
Outlet of Coeur d'Alene Lake	3,750
Washington-Idaho Boundary	4,125
Spokane	4,350
Downstream from Little Spokane River	5,980
Mouth (at Miles)	6,640
St. Joe River:	
Downstream from St. Maries River	1,725
Mouth	1,886
St. Maries River at Mouth	480
Coeur d'Alene River:	
Leland Glen Dam Site	594
Downstream from South Fork	1,210
Springston Dam Site	1,468
Mouth	1,488
North Fork of Coeur d'Alene River at Mouth	171
South Fork of Coeur d'Alene River at Mouth	312
Latah Creek at Mouth	767
Little Spokane River at Mouth	640
Chamokane Creek at Mouth	176

Source:
Corps of Engineers 308 Report

TABLE 4

SUMMARY OF PRECIPITATION AND TEMPERATURE DATA
(THROUGH 1946)

Station	Elev. in Feet	Precipitation in Inches			Mean Annual Snow-fall (inches)	Temperature °F.			Average Growing Season
		Mean Annual	Max.	Min.		Mean Annual	Max.	Min.	
Avery, Idaho	2500	31.15	45.28	21.10	66	46.9	108	-25	116
Burke, Idaho	4093	45.22	60.44	36.70	202	40.4	95	-21	2/
Cheney, Wash.	2400	17.14	27.29	12.15	39	48.5	107	-26	134
Coeur d'Alene, Idaho1/	2160	24.35	37.95	13.99	50	47.3	108	-34	146
Deer Park, Wash.	2165	20.35	30.42	11.87	55	45.2	107	-42	102
Fort Spokane, Wash.	1400	13.81	24.19	5.13	57	2/	2/	2/	2/
Kellogg, Idaho	2305	29.32	41.82	19.87	57	46.7	109	-27	129
Prichard, Idaho	2400	35.96	50.65	25.36	69	2/	2/	2/	105
Roland, Idaho	4150	49.74	81.05	35.54	261	42.3	96	-24	107
Spokane, Wash.	1954	16.62	25.99	7.54	36	48.2	108	-30	183
Wallace, Idaho	2770	38.18	60.87	24.80	83	46.1	105	-24	143
Wellpinit, Wash.	2450	17.37	26.94	8.67	49	2/	2/	2/	117

1/ Record for Coeur d'Alene and Gibbs combined.
2/ No record available.

Source: Adapted from Corps of Engineers 308 Report.

TABLE 5 — STREAM FLOW

Discharge of Coeur d'Alene River Near Cataldo, Idaho Unit c.f.s. Drainage Area 1220 Sq. Miles

YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	YEAR MEAN
1926	334	363	906	631	1900	3290	5050	2180	768	404	314	568	1390
1927	1050	1890	3350	1700	2620	2690	7970	9570	5100	1210	542	839	3210
1928	1980	6530	3720	2860	1770	4910	5800	8350	1710	735	422	339	3270
1929	449	563	370	305	276	1760	4550	5560	1570	617	358	334	1400
1930	317	238	511	241	1530	2240	4790	2570	1520	601	329	278	1260
1931	334	428	276	495	1040	3420	6560	4190	919	416	276	318-	1560
1932	322	394	353	762	1980	4850	12100	10900	3400	906	462	380	3060
1933	427	2460	2350	1720	760	2270	8820	9100	6770	1280	571	485	3090
1934	871	2131	13230	8323	4265	6490	6336	2444	971	516	320	298	3862
1935	636	1907	1857	2214	2297	3004	7915	9218	2721	808	462	330	2780
1936	324	338	317	550	383	2026	10730	6296	1742	656	347	321	1997
1937	285	253	521	269	277	1393	6437	8090	2327	818	484	362	1799
1938	281	1531	2541	2721	1278	3759	10200	5846	1892	735	407	323	2628
1939	373	422	666	813	583	2798	7883	4952	1419	651	331	295	1767
1940	317	323	1093	739	1994	5624	6000	3426	954	427	273	288	1786
1941	347	535	1178	1077	1097	2602	2489	2683	1571	588	366	533	1257
1942	677	1276	4232	1250	1268	2005	6204	3400	2452	1263	509	365	2076
1943	328	1714	1374	1174	1009	2678	12570	6524	3577	1355	583	388	2768
1944	384	439	946	434	603	837	3905	2863	1034	453	299	340	1043
1945	276	387	389	2227	2520	2291	4338	8327	2020	665	376	479	2023
TOTAL	10312	24122	40180	30505	29450	60937	14064	7116489	44437	15104	8031	7863	44026
MEAN	516	1206	2009	1525	1473	3047	7032	5824	2222	755	402	393	2201

TABLE 6 -- STREAM FLOW

Lischarge of Spokane River at Spokane						Unit c.f.s.				Drainage Area 4350 Sq. Miles		
YEAR	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	YEAR MEAN
1926	1820	1760	1870	2470	6060	7280	10300	7370	2140	1960	1530	1510	3820
1927	2160	4750	10500	5330	7140	9050	12400	24700	18600	3530	2180	2040	8540
1928	5640	13100	15900	9300	6840	11100	15600	23000	8960	2480	1770	1600	9620
1929	1690	1760	1750	1560	1490	2050	7160	13500	5730	1870	1540	1720	3490
1930	1480	1460	1360	1590	2650	4030	11300	7510	4400	1520	1440	1420	3340
1931	1390	1350	1340	1340	2060	6610	13900	11500	2620	1360	1370	1390	3860
1932	1370	1230	1230	2660	2500	11600	23800	29800	14100	2600	1510	1440	7820
1933	1560	5690	5220	5040	3020	5670	14100	22900	21800	4440	1600	1530	7720
1934	3037	7195	22910	25430	14310	12960	20930	9957	3073	1666	1480	1433	10360
1935	1414	4271	4675	5690	6609	8084	14070	23000	11200	2412	1745	1958	7090
1936	1735	1261	1315	2027	2529	5791	16430	22640	6448	1932	1731	1840	5478
1937	1938	1374	1353	1750	1575	2714	11920	19800	8351	2137	1528	1836	4702
1938	1494	2408	5664	7645	4954	9646	18890	19830	8030	2024	1534	1666	6990
1939	1798	1792	1605	2140	2965	5142	16360	16630	3999	1976	1930	1783	4846
1940	1533	1151	1645	2310	5252	13070	15140	10830	3116	1679	1506	1498	4889
1941	1584	1798	3812	4780	4285	4876	4261	6915	4617	1557	1517	1661	3470
1942	2123	3572	9652	4303	5175	5139	12460	9135	6143	2958	1212	1244	5254
1943	1495	4060	4570	4445	4315	4986	25030	19100	14220	3477	1577	1514	7383
1944	1851	2230	3312	2645	2934	2512	6843	6026	2884	1449	1521	1526	2974
1945	1735	1881	1754	3201	5341	6753	9320	18430	6967	2672	1019	1378	5036
TOTAL	38847	64093	101437	95656	92004	139063	280214	322573	157398	45699	31240	31987	116682
MEAN	1942	3205	5072	4783	4600	6953	14011	16129	7870	2285	1562	1599	5834

TABLE 7

MEAN MONTHLY STREAM-FLOW DATA (THROUGH WATER YEAR 1946)

Stream	Station	Observed Discharge, Cubic Feet per Second												
		Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Annual
Coeur d'Alene	At Enaville, Idaho	307	845	1244	957	1091	2118	5209	4028	1512	587	311	314	1543
Coeur d'Alene	Near Cataldo, Idaho	512	1189	1881	1664	1853	3080	7312	6377	2313	776	423	404	2314
Spokane	At Post Falls, Idaho	1445	2533	4216	4792	4728	7053	14740	17180	8571	2046	1110	1116	5793
Spokane	At Spokane, Washington	2023	3214	4852	5282	5183	7624	14212	17937	11182	4032	2129	1850	6628
Spokane	At Long Lake, Washington	2330	3386	5336	5386	6266	8415	15079	15160	7521	3041	2055	2174	6339
St. Joe	At Calder, Idaho	558	998	1365	1030	1132	1878	5651	7650	3740	1117	543	456	2179
St. Maries	At Lotus, Idaho	102	248	425	399	502	925	1582	965	376	110	58	69	479

Source: Corps of Engineers 308 Report.

TABLE 8

RESULTS OF ANALYSES OF THE TOTAL LEAD CONTENT OF WATER FROM THE COEUR D'ALENE MUNICIPAL WATER DISTRIBUTION SYSTEM

By Idaho State Department of Public Health

Lead Content in P.P.M.

Month	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950
Jan.	.03	.02	.01	.013	.02	.04	.02	.03	--	.002	.004	.005	.01	.005	.01	.005	.005
Feb.	.012	.013	.017	.03	.013	.04	.02	.015	.012	.004	.002	.005	.01	.015	.005	--	--
March	.04	.02	.048	.013	.037	.028	.02	.015	.010	.004	Tr.	.01	.01	.01	.005	.005	.005
April	.03	.015	--	.013	.033	.04	.022	.006	.006	.004	--	.01	.005	.01	.005	--	
May	.033	--	.026	--	.086	.045	.02	.018	.008	.06	.006	.01	--	.01	.005	.005	
June	.02	--	.023	--	.06	.04	.012	.008	.015	.006	.005	.01	.01	.005	--	--	
July	.04	.023	.025	.035	.054	.031	--	.008	.004	.03	.005	.01	.005	.005	.01	.005	
Aug.	.03	.032	.017	.048	.063	.035	.015	.005	.004	.001	.005	.01	.01	.01	.01	.005	
Sept.	.03	.015	.027	.031	.03	.02	.015	.002	.012	.019	.008	.01	.01	.005	.005	.005	
Oct.	.01	.04	.013	.02	.013	.012	.016	.008	.004	--	---	.005	.005	.005	.005	.005	
Nov.	.01	.037	.019	.012	.034	.02	.065	.006	.004	.010	.005	--	.005	.05	.005	.005	
Dec.	.013	.01	.02	.036	.043	.016	.017	.019	.004	.004	.005	.01	.005	.05	--	.005	

TABLE 9 — MUNICIPAL WATERWORKS

Name of Municipality (1)	Population Served (2)	Source of Supply (3)	Estimated Water Consumption M.g.d. Aver. Daily (4)	Estimated Water Consumption M.g.d. Summer Mo. Ave. Daily (5)	Treatment (6)
SURFACE WATER					
Idaho					
Coeur d'Alene	15,600	Lake Coeur d'Alene	3.74	7.18	Chlorination
Kellogg	6,500	Big Creek	1.30	2.60	"
Wallace	3,900	Placer, Watson & Spring Creeks	.80	1.60	"
Kellogg	2,500	Gov't. Gulch & Miners Slough	.50	1.00	"
Mullan	2,300	Mill & Boulder Creeks	.50	1.00	None
St. Maries	2,250	Rochat Creek	.45	.90	Chlorination
Wardner	1,500	Milo Creek	.30	.60	"
Spirit Lake	1,100	Spirit Lake	.24	.48	"
Dalton Gardens Irrigation District	880	Hayden Lake	.19	.40	None
Coeur d'Alene Country Club	2,000*	Hayden Lake	.07	.30	Chlorination
Hayden Lake Irrigation District	750	Hayden Lake	.16	.33	"
Burke	600	Mace Tunnel & Canyon Creek	.13	.26	"
Osburn	500	Meyer Creek & McFarren Gulch	.10	.20	None
Bunker Hill & Sullivan Mining & Conc. Co., Mine & Smelter, Kellogg	500	Miners Slough	.10	.20	Chlorination
Bunker Hill & Sullivan Mining & Conc. Co., Zinc Plant & Co., Housing	500	Government Gulch	.10	.20	"

* Summertime peak population

TABLE 9 — MUNICIPAL WATERWORKS -- Page 2

(1)	(2)	(3)	(4)	(5)	(6)
SURFACE WATER (Cont.)					
Idaho (Cont.)					
Osburn (Dunkele)	420	Shields Gulch	.09	.19	None
Avondale Irrigation District	400	Hayden Lake	.09	.18	None
Fernwood	150	Crystal Creek	.03	.07	None
Summer Youth Camps (7)	910*	Lake Coeur d'Alene & Hayden Lake	.03	.18	Chlorination
Subtotal	43,260		8.92	17.87	
Washington					
Clayton	325	Dragoon Creek	.08	.11	Chlorination
TOTAL SURFACE WATER	43,585		9.00	17.98	
GROUND WATER					
Idaho					
Post Falls	1,100	Wells	.25	.51	None
Rathdrum	530	Wells & Spring Creek	.12	.23	None
Plummer	400	Wells	.09	.18	Chlorination
Harrison	400	Wells & Lake Auxiliary	.09	.18	"
Post Falls Irrigation District	300	Wells	.07	.13	None
Worley	300	Wells	.07	.13	None
Avery	300	Well & Avery Creek Auxiliary	.07	.13	Chlorination
Upper Twin Lakes	300	Spring	.07	.13	None
McGuire Water Corp.	200	Well	.05	.09	None

* Summertime peak population

TABLE 9 — MUNICIPAL WATERWORKS — Page 3

(1)	(2)	(3)	(4)	(5)	(6)
GROUND WATER (Cont.)					
Idaho (Cont.)					
Blanchard	115	Well	.03	.05	None
Santa	100	Spring	.02	.04	None
Emida	100	Well	.02	.04	None
Resort Settlements	1,100*	Wells & Springs	.01	.05	None
Summer Youth Camps (3)	520*	Wells & Springs	.02	.10	Springs—Chlorinated
Subtotal	5,765		.98	1.99	
Washington					
Spokane	168,000	Wells	53.20	85.20	Chlorinated
Modern Electric Water Co.	8,400	Wells	1.08	1.76	None
Orchard Avenue Water District	4,200	Wells	.55	.88	None
Cheney	2,950	Wells	.40	.64	Chlorination
Vera Irrigation District	2,650	Wells	.34	.56	None
Trentwood Irrigation District	2,250	Wells	.29	.47	None
Hutchison Addition Co.	2,150	Wells	.28	.45	None
North Spokane Water District	1,750	Wells	.26	.42	None
East Spokane Water District	1,700	Wells	.22	.36	None
Pasadena Water District	1,600	Wells	.21	.34	None
Carnhope Irrigation District	1,400	Wells	.18	.30	None
Eastern Washington College of Education	1,400	Wells	.16	.25	None
Tekoa	1,380	Wells	.21	.34	None
Community Water District	1,350	Wells	.18	.30	None
Millwood	1,230	Wells	.16	.26	None
Whitworth Water District	1,200	Wells	.18	.29	None
Deer Park	1,250	Wells	.29	.46	None
Miscellaneous Small Water Districts in Spokane Valley	1,100	Wells	.11	.18	None

* Summertime peak population

TABLE 9 -- MUNICIPAL WATERWORKS -- Page 4

(1)	(2)	(3)	(4)	(5)	(6)
GROUND WATER (Cont.)					
Washington (Cont.)					
Greenacres Irrigation District	850	Wells	.11	.18	None
Whitworth College	850	Wells	.07	.16	None
University Place Water District	420	Wells	.05	.09	None
Rockford	410	Wells	.06	.10	None
Fairfield	400	Wells	.06	.10	None
Mead	400	Wells	.06	.10	None
Model Water & Light Co.	380	Wells	.05	.08	None
Yardley Water District	380	Wells	.05	.08	None
Latah	325	Wells	.05	.07	None
East Farms Irrigation District	300	Wells	.04	.06	None
Irvin Water District	300	Wells	.04	.06	None
Edgecliff Sanitarium	290	Wells	.03	.04	None
Dishman Water District	250	Wells	.03	.05	None
Spangle	245	Wells	.03	.05	None
Eastwood Irrigation District	200	Wells	.03	.04	None
Liberty Lake Utility Co.	200	Springs & Surface Auxiliary	.03	.04	None
St. Michaels Scholasticate	170	Well	.07	.10	None
Bacon Tracts Irrigation District	140	Well	.02	.03	None
Army, Navy, and Air Force Installations	Variable	Well	Variable	Variable	—
Velox Naval Supply Depot	Variable	Well	Variable	Variable	—
Subtotal	212,470		59.18	94.89	
TOTAL GROUND WATER	218,235		60.16	96.88	
GRAND TOTAL ALL WATER	261,820		69.16	114.86	

TABLE 10 -- INDUSTRIAL WATERWORKS

Name of Industry (1)	Location (2)	Source of Supply (3)	Est. Water Requirements Average Daily M.g.d. (4)	Treatment (5)
SURFACE WATER				
Idaho				
Ore Concentration Mills	(20 Locations)	South Fork Coeur d'Alene River or Tributary	4.77	None
Potlatch Forests, Inc.	Coeur d'Alene	Coeur d'Alene Lake	6.50	None
Subtotal			11.27	
Washington				
Union Sand & Gravel	Spokane	Spokane River	.24	None
Crystal Laundry Co.	Spokane	Spokane River	.15[1]	None
Washington Brick & Lime Co.	Clayton	Dragoon Creek	.03	
TOTAL SURFACE WATER			11.69	
GROUND WATER				
Idaho				
Ohio Match Co.	Coeur d'Alene	Well	.02	None
V. J. Packing Co.	Coeur d'Alene	Well	.01	None
Bunker Hill & Sullivan Smelter	Kellogg	Wells	Unknown	None
Subtotal			.03	
Washington				
Inland Empire Paper Co.	Millwood	Wells	8.67	None
Kaiser Aluminum & Chemical Corporation	Mead	Wells	2.32	None
Pacific Northwest Alloys	Mead	Wells	1.30	None

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[1] Includes an auxiliary well supply of .05 m.g.d.

TABLE 10 -- INDUSTRIAL WATERWORKS -- Page 2

(1)	(2)	(3)	(4)	(5)
GROUND WATER (Cont.) Washington (Cont.)				
Armour & Co.	Spokane	Wells	1.00	Chlorination
Kaiser Aluminum & Chemical Corporation	Trentwood	Wells	1.00	Chlorination
Carstens Packing Co.	Spokane	Wells	.84	None
Great Northern R.R.	Spokane	Wells	.70	None
Great Northern Ice Co.	Spokane	Wells	.50	None
Bohemian Breweries, Inc.	Spokane	Wells	.37	None
Empire Cold Storage Co.	Spokane	Wells	.36	Softening & Chlorination
Brewer Lumber Mills, Inc.	Spokane	Wells	.30	None
Spokane Brewing & Malting Co.	Spokane	Wells	.30	None
Acme Sand & Gravel Co.	Irvin	Well	.29	None
Baird-Naundorff Lumber Co.	Spokane	Well	.29	None
Addison Miller Ice Co.	Yardley	Well	.25	None
Addison Miller Ice Co.	Hillyard	Well	.25	None
Swift & Co.	Spokane	Well	.23	None
Sicks' Spokane Brewery	Spokane	Well	.18	None
National Pole Treating Co.	Spokane	Well	.15	None
Sperry Flour Mills	Spokane	Well	.15	None
Diamond Match Co.	Spokane	Well	.15	Unknown
Centennial Flour Mill	Spokane	Well	.15	None
Pike Lumber Co.	Spokane	Well	.14	None
Davenport Hotel	Spokane	Well	.14	Softening & Chlorination
Spokane Rendering Co.	Spokane	Well	.12	None
Deer Park Pine Industries	Deer Park	Well & Spring	.10	None
Spokane Flour Mills	Spokane	Well	.07	None
Spokane Toilet Supply Co.	Spokane	Well	.08	Softening
Hazlewood Cold Storage Co.	Spokane	Well	.06	None
Ideal Laundry Co.	Spokane	Well	.06	None
Industrial Air Products Co.	Spokane	Well	.06	None
Washington Brick & Lime Co.	Dishman	Well	.04	None
Cassin Orndorf Co.	Spokane	Well	.03	None
Troy Laundry Co.	Spokane	Well	.03	None
Paris Cleaners	Spokane	Well	.03	None
Old Union Stockyards	Spokane	Wells	.03	None
New Method Laundry	Spokane	Well	.02	None
Lundin Bros. Laundry	Spokane	Well	.02	None

TABLE 10 -- INDUSTRIAL WATERWORKS -- Page 3

(1)	(2)	(3)	(4)	(5)
GROUND WATER (Cont.) **Washington** (Cont.)				
American Laundry	Spokane	Well	.02	Softening
Union Pacific R.R.	Fairfield	Well	.02	None
Philips Oil Refining Co.	Hillyard	Well	.02	None
Chas. M. Rice & Son (Meat)	Vera	Well	.01	None
White Pine Sash Co.	Spokane	Wells	.01	None
Wash. Water Power Co.	Nine Mile Falls	Well	.01	None
E. C. Olson Lumber Co.	Spokane	Well	.00	None
TOTAL GROUND WATER			21.26	
GRAND TOTAL ALL WATER			32.95	

TABLE 11

PRINCIPAL WATER SUPPLIES -- SPOKANE METROPOLITAN AREA

	Water Requirement M.g.d.				
Name of Supply** (1)	Average Daily (2)	Max. Daily (3)	Capacity of Supply Facilities M.g.d. (4)	Treatment (5)	Estimated Surplus Capacity M.g.d. (6)
MUNICIPAL					
Spokane	53.20	113.60	294.72	Chlor.	181
Modern Electric Water Co.	1.08	2.43	51.00	None	*
Hutchison Addition Co.	.28	.63	9.05	None	*
Model Water & Light Co.	.05	.13	6.50	None	*
Orchard Avenue W.D.	.55	1.24	5.12	None	*
Carnhope I.D.	.18	.40	3.46	None	*
Vera I.D.	.34	.76	3.30	None	*
Bacon Tracts I.D.	.02	.05	2.20	None	*
Millwood***	.16	.40	2.15	None	*
Medical Lake	1.15	2.10	2.10	None	None
Yardley W.D.	.05	.08	1.92	None	1
Irvin W.D.****	.04	.10	1.72	None	1
East Spokane W.D.	.22	.36	1.50	None	1
Pasadena W.D.	.21	.34	1.50	None	1
Trentwood I.D.	.29	.65	1.44	None	None
North Spokane W.D. #8	.26	.58	1.44	None	None
Cheney	.40	.64	1.10	Chlor.	None
Whitworth W.D. #2	.18	.29	1.08	None	None
Deer Park	.29	.46	1.00	None	None
Tekoa	.21	.34	1.00	None	None
TOTAL MUNICIPAL	59.16		394.90		185
INDUSTRIAL					
Inland Empire Paper Co.	8.67	8.67	24.20	None	16
Kaiser Aluminum & Chemical Corporation (Mead)	2.32	4.96	8.56	None	3
Pacific Northwest Alloys	1.30	3.60	3.60	None	None
Kaiser Aluminum & Chemical Corporation (Trentwood)	1.00	1.44	1.44	None	None
White Pine Sash Co.	0.01	1.08	1.08	None	None
Armour & Co.	1.00	1.00	1.15	None	None

TABLE 11 -- Page 2
PRINCIPAL WATER SUPPLIES -- SPOKANE METROPOLITAN AREA

(1)	(2)	(3)	(4)	(5)	(6)
INDUSTRIAL (Cont.)					
Carstens Packing Co.	.84	.84	1.08	None	None
Brewer Lumber Mills Inc.	.30	.72	.72	None	None
Great Northern R.R.	.70	.70	2.16	Chlor. & Soft.	1
Great Northern Ice Co.	.50	.50	.50	None	None
Empire Cold Storage Co.	.36	.43	.70	Softening	None
E. C. Olson Lumber Co.	.00	.29	.87	None	None
Old Union Stockyards	.03	.30	1.08	None	None
Spokane Brewing & Malting Co.	.30	.30	1.08	None	None
TOTAL INDUSTRIAL	17.33		48.22		20
GRAND TOTAL	76.49		443.12		205

* Surplus Capacity required for irrigation.
** All supplies obtained from Ground Water Source.
*** Supplied by Inland Empire Paper Co.
**** Supplied by Spokane Portland Cement Co.

TABLE 12

WATER REQUIREMENTS FOR IRRIGATION

Development	Area Acres	Estim. Water Requirement Acre-ft./yr.	Source of Supply
IDAHO			
Avondale I.D.	907	3640	Hayden Lake (pumping)
Hayden Lake I.D.	1050	2625	"
Dalton Gardens I.D.	944	3500	"
Post Falls I.D.	3109	14000	Spokane River
East Greenacres	1551	4500	Twin Lakes (gravity)
Subtotal	7561	28265	
WASHINGTON			
Bacon Tracts I.D.	170	340	Wells
Carnhope I.D.	192	400	Wells
East Spokane W.D.	300	600	Wells
Hutchison Addition Co.	312	625	Wells
Model Water & Light Co.	220	440	Wells
Modern Electric Water Co.	3000	6000	Wells
Orchard Avenue I.D.	482	960	Wells
Pasadena W.D.	600	1200	Wells & Surface Auxiliary
Trentwood I.D.	1000	2000	Surface & Wells Auxiliary
University Place W.D.	160	320	Wells
Vera I.D.	2200	4400	Wells & Surface
Yardley W.D.	100	200	Wells
Millwood	546	1090	Wells
Greenacres I.D.	612	1225	Surface
East Farms I.D.	1000	2000	Surface (gravity)
Otis Orchards	2454	4900	Surface (gravity)
Spokane Valley #10	4356	8800	Surface (gravity)
West Farms	286	570	Surface (gravity)
North Spokane W.D. #8	300	600	Wells
Cemetery & Park Irrigation in Spokane & Vicinity	Unknown	2000	Wells
Subtotal	18290	38670	
GRAND TOTAL	25851	66935	

Source: Bureau of Reclamation and Local Agencies.

TABLE 13

HYDROELECTRIC POWER PROJECTS

Name	Stream	Average Head Feet	Instl'd. Cap. in KW	Owner
Little Falls	Spokane River	72	32,000	Washington Water Power Co.
Long Lake	" "	169	70,000	"
Nine Mile	" "	61	12,000	"
Spokane:				
Monroe Street	" "	73	7,200	"
Upper Falls	" "	61	10,000	"
Post Falls	" "	55	11,250	"
Spokane City Plant	" "	31	4,500	City of Spokane
			146,960	

Source: Corps of Engineers 308 Report.

TABLE 14

POPULATION DISTRIBUTION AND TRENDS

	Idaho	Washington	Total	Percent of Total
Census 1920				
Rural	26,044	35,677	61.721	35
Urban	12,280	104,437	116,717	65
Total Population	38,324	140,114	178,438	100
Census 1930				
Rural Non-Farm	20,489	18,717	39,206	20
Rural Farm	7,835	15,307	23,142	12
Total Rural	28,324	34,024	62,348	32
Urban	16,055	115,514	131,569	68
Total Population	44,379	149,538	193,917	100
Census 1940				
Rural Non-Farm	21,753	20,020	41,773	20
Rural Farm	10,485	21,861	32,346	15
Total Rural	32,238	41,881	74,119	35
Urban	18,123	122,001	140,124	65
Total Population	50,361	163,882	214,243	100
Census 1950				
Total Population	53,490	219,560	272,600	

Source: Adapted from Table Corps of Engineers Report and Bureau of Census Reports for 1950.

TABLE 15

INDUSTRIAL DISTRIBUTION OF EMPLOYED PERSONS, 1940

Industry	Employed Persons	
	Number	Percent of Total
Extractive Industries:		
Agriculture	8,000	10
Logging	1,117	2
Forestry	260	*
Mining	4,778	6
Total	14,155	19
Processing Industries:		
Saw and Planing Mills	2,955	4
Other wood products	721	1
Food and kindred products	2,278	3
Nonferrous metal manufacturing	781	1
Paper and allied	382	*
Iron and steel	243	*
Other manufacturing	2,866	4
Total	10,226	13
Service Industries:		
Construction	3,927	5
Transportation	5,660	7
Wholesale and retail trade	16,442	22
Professional and Government	11,071	14
Miscellaneous service	14,702	19
Total	51,802	67
Industry not Classified	1,033	1
Total employed	77,216	100

* Less than 1 percent

Source: Corps of Engineers 308 Report.

TABLE 16 -- LAND DISTRIBUTION BY USE (IN ACRES)

State	Total Land in Basin	Total	Agricultural Land		Permanent Pasture	Range	Forest Area	Waste & Miscel-laneous
			Irrigated	Non-Irrigated				
Idaho	2,745,331	264,732	5,461	175,286	83,985	9,240	2,459,849	11,510
Washington	1,455,466	648,112	16,852	375,833	255,427	---	781,488	25,866
Total	4,200,797	912,844	22,313	551,119	339,412	9,240	3,241,337	37,376

Source: Corps of Engineers 308 Report.

TABLE 17 -- PUBLIC LANDS AND RESERVATIONS (ACRES)

State	Total	Percent of Total Land in Basin	National Forests	Public Domain	Indian Reservations	Game Refuges	Other Federal Lands	State Forests	State Parks
Idaho	1,700,139	62	1,415,165	136,455	16,414	---	123,279	7,838	988
Washington	340,488	23	---	187,719	68,394	7,894	18,588	37,639	20,254
Total	2,040,627	49	1,415,165	324,174	84,808	7,894	141,867	45,477	21,242

Source: Corps of Engineers 308 Report.

TABLE 18 — AGRICULTURAL RESOURCES

State	Number of Farms	Average Size of Farms	Total Acres	Land in Farms		All Other Uses Acres	Value of Land and Buildings	
				% of Land Area	Cropland Acres		Total (81000)	Per Acre (Dollars)
Idaho	2,390	211	503,671	18	162,811	340,860	$16,939	$34
Washington	4,680	216	1,012,402	70	493,548	518,854	52,418	52
Total	7,070	214	1,516,073	36	656,359	859,714	$69,357	$46

Source: Adapted from Table Corps of Engineers 308 Report.

TABLE 19 — GROSS FARM INCOME, 1944

Product	Gross Values			Percent of Total
	Idaho	Washington	Total	
Livestock and Livestock Products Sold	$2,203,000	$5,620,000	$ 7,823,000	34
Crops Sold	2,377,000	10,438,000	12,815,000	56
Farm Products Used by Farm Households	771,000	1,263,000	2,034,000	9
Forest Products Sold	108,000	57,000	165,000	1
Total	$5,459,000	$17,378,000	$22,837,000	100

Source: Adapted from Table Corps of Engineers 308 Report.

TABLE 20

MINERAL RESOURCES -- ANNUAL MINERAL PRODUCTION

Mineral	Unit	Calendar Year				
		1941	1942	1943	1944	1945
Gold	Fine Ounces	3,421	2,702	2,258	2,075	1,898
Silver	Fine Ounces	14,678,356	12,977,287	10,302,840	8,669,371	7,115,646
Copper	Pounds	5,957,000	5,986,000	3,974,000	2,578,000	2,036,000
Lead	Pounds	191,057,000	212,947,000	179,626,000	153,625,000	126,860,000
Zinc	Pounds	136,642,000	156,625,000	159,268,000	170,454,000	156,059,000
Mines Producing	Number	80	58	51	48	50
Ore Sold or Treated	Short Tons	2,051,390	2,327,417	2,270,385	2,765,485	2,794,208
Total Value of All Products	Dollars	32,399,002	38,880,743	38,595,008	38,307,297	34,258,050

Source: Adapted from Table Corps of Engineers 308 Report.

TABLE 21

UNRESERVED SAW TIMBER, JANUARY 1, 1945

Millions of Board Feet, Log Scale, Scribner Rule

Specie	Idaho	Washington	Total
Ponderosa Pine	790	656	1,446
Douglas Fir	2,099	276	2,375
Western Whitepine	2,925	51	2,976
Western Larch	1,845	209	2,054
Balsam Fir	1,424	---	1,424
Other Softwoods	2,125	157	2,282
Total	11,208	1,349	12,557

Summarized from Table, Corps of Engineers 308 Report.

TABLE 22

LUMBER PRODUCTION, 1941 - 1946

(Thousand feet, board measure)

Year	Idaho	Washington	Total
1941	206,694	141,148	347,842
1942	14,563	117,175	131,738
1943	131,196	87,070	218,266
1944	148,011	108,097	256,108
1945	148,150	91,007	239,157
1946	178,394	32,341	260,735

Summarized from Table, Corps of Engineers 308 Report.

TABLE 23 -- MANUFACTURING, 1947

Item	Unit	Idaho	Washington	Total
Establishments	Number	74	266	340
Wage Earners (average)	Number	2,255	10,773	13,028
Wages	$1000	3,262*	30,658	33,920*
Value Added	$1000	6,833*	70,893	77,726*

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* Exclusive of Shoshone County, Idaho.
Source: Census of Manufacturing, 1947.

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STATE OF WASHINGTON
POLLUTION CONTROL COMMISSION
ADMINISTRATION BUILDING
OLYMPIA, WASHINGTON

ARTHUR B. LANGLIE
Governor

E. F. ELDRIDGE
Director and
Chief Engineer

November 9, 1950

Div. of Water Pollution Control
U. S. Public Health Service
Swan Island, Building #24
Portland 18, Oregon

ATTENTION: Mr. Robert R. Harris

Gentlemen:

We have reviewed the Spokane River Basin, Sub-Basin D Report, which was prepared in your office. We are impressed with the completeness and thoroughness of this report and feel that it certainly points out the situation as it exists today, in this river basin.

You can be assured that this report has the full concurrence and approval of this Commission.

Very truly yours,

/s/ E. F. Eldridge
E. F. Eldridge
Director and Chief Engineer

"Keep Washington Waters Clean"

Len Jordan, Governor
Ex-Officio Commissioner

L. J. Peterson, M.S.P.H.
Administrative Director

STATE OF IDAHO
DEPARTMENT OF PUBLIC HEALTH
DIVISION OF ENVIRONMENTAL SANITATION
H. C. Clare, M.S. Eng., Chem. Eng.
Director
Box 640 -- Phone 3800
BOISE, IDAHO

September 4, 1952

R. R. Harris, Officer in Charge
Division of Water Pollution Control
Public Health Service
Swan Island Building 24
Portland 18, Oregon

Dear Mr. Harris:

We have reviewed the report on Water Pollution Control, Spokane River Basin, 1952, a Cooperative State-Federal Report prepared by your office in cooperation with the Washington Pollution Control Commission and this Department. This report has been well prepared and written and contains a great deal of valuable baseline information. You may consider this letter as our approval of the report.

Very truly yours,

/s/
H. C. Clare

HCC:bf

C O P Y

CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DIVISION ENGINEER
NORTH PACIFIC DIVISION
500 Pittock Block
PORTLAND 5, OREGON

C O P Y

NPDVG

Refer to File

August 9, 1950

No. NPD 800.224(Spokane River)
Seattle District-1.3

Mr. Robert R. Harris
Officer-in-Charge
Division of Water Pollution Control
U. S. Public Health Service
Swan Island Building No. 24
Portland 18, Oregon

Dear Mr. Harris:

Review of your "Report on Water Pollution - Subbasin D, Spokane River Basin, 1950", which was submitted to this office by your letter dated June 15, 1950, has been completed by Colonel E. C. Itschner, Seattle District Engineer, and by this office.

No exception is taken to the report findings.

The report is inclosed.

FOR THE DIVISION ENGINEER:

Sincerely yours,

/s/
JOHN P. BUEHLER
Lt. Col., Corps of Engineers
Executive Officer

1 Incl.
Report

COPY OF COPY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
Regional Office, Region 1
Box 937
Boise, Idaho

Officer in Charge
Public Health Service
Division of Water Pollution Control
Swan Island Building 24
Portland 18, Oregon

Dear Sir:

Enclosed are my comments on the three following Public Health Service subbasin reports:

(1) Subbasin E, Yakima River Basin.

(2) Spokane River Basin - Subbasin D.

(3) Willamette River Basin - Subbasin J.

My comments on your Basin Report have been made the subject of a separate letter which was dispatched to your office on October 17, 1950.

I understand that additional reports are to be made for each of the subbasins covered in your Basin Report. I shall appreciate the opportunity of reviewing each of them as they become available.

I take this opportunity to thank you for your prompt response to my request that a member of your staff meet with us here in Boise to discuss the subbasin reports we have at hand. As a result of the meeting with Mr. McGrath, we have eliminated a number of comments which we would have otherwise been compelled to include here.

With Mr. McGrath's permission, we have retained the preliminary draft of the above reports in our files.

Sincerely yours,

/s/ Lyle Cunningham

Assistant Regional Director

Enclosures 3

Enclosure No. 2 C O P Y

Comments on Spokane River Basin - Subbasin D.

I concur in the sections of this report for which this office has definite responsibility.

/s/ J. Lyle Cunningham
Assistant Regional Director

Address Only The Regional Director
Fish and Wildlife Service
And Refer To
1-RB

Region 1

Washington
Oregon
California
Nevada
Idaho
Montana

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

OFFICE OF REGIONAL DIRECTOR

Swan Island
Portland, Oregon
(18)

July 14, 1950

Officer in Charge, Public Health Service
Division of Water Pollution Control
Swan Island Building 24
Portland 18, Oregon

Dear Sir:

We have reviewed the attached copy of your report on water pollution for the Spokane River Basin as requested in your letter of June 15. This report is very well prepared, and your statements on fish and wildlife resources adequately cover these subjects. A few minor editorial notes may be found on appropriate pages, but, aside from these, we have no comments to offer.

This, and your previously-prepared reports on pollution problems in the various subbasins of the Columbia River drainage, will prove invaluable to many phases of our river basin studies, and we hope that you will send us final reports on them at an early date. They will assuredly be well received by all agencies concerned with pollution problems in this region.

Very truly yours,

/s/
Paul T. Quick
Acting Regional Director

Enclosure

COPY

COPY

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES

Region II

Office of Regional Director

Post Office Box 492
Albany, Oregon

August 21, 1950.

Officer in Charge
U. S. Public Health Service
Division of Water Pollution Control
Swan Island, Building 24
Portland 18, Oregon

Dear Sir:

Attached hereto is a copy of your report on water pollution for the Spokane River Basin, which was forwarded to this office for review and criticism by Mr. Robert R. Harris, Sr., Sanitary Engineer.

The report is well prepared and covers the subject in detail. The problem of controlling ore mill wastes and smelter fumes that endanger the public health, destroy fish and wild life, and reduce the recreational advantages of the areas affected is of particular interest to our Bureau. We desire, therefore, to cooperate on this phase of the broad program with your organization, as well as with the other interested Federal and State Agencies by furnishing technical assistance and laboratory facilities where possible under our limited allotments and personnel.

Dr. L. C. McCabe, Chief, Air and Stream Pollution Prevention Research Division, Washington, D. C., directs the Bureau of Mines activities along these lines, and he should, if possible, receive a final copy of the report. Also, Mr. L. H. McGuire, Chief, Accident Prevention and Health Division for the Bureau of Mines in this Region, should receive a copy together with a copy for this office.

My comments on the report follow: page 18, first paragraph and page 30, third paragraph.

It is my impression through correspondence that the U. S. Department of Interior, Fish and Wild Life Service can enlarge on these paragraphs from data that they have collected since 1931, and therefore, it is suggested this organization be consulted for more complete information.

On page 35, the statement is made as follows:

"It is hard to believe, however, that the dredging of an average of one million cubic yards of tailings from the river each year since 1932 hasn't had some beneficial effect on downstream water uses. Although, during this same period probably an equal or greater yardage of tailings were discharged into the river above Cataldo Mission, it is

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believed that only a small percentage of the total amount of poisonous wastes entering the river reached Coeur d'Alene Lake. This is bound to have had a material effect upon the use of the lake waters for drinking purposes and on fish life in the lake." This conclusion seems to be substantiated from analysis of Appendix D - Table 8, page 30, entitled, "Results of Analyses of the Total Lead Content of Water from the Coeur d'Alene Municipal Water Distribution System", by Idaho State Department of Public Health.

Whereas, the table shows a lead content averaging 0.0248 p.p.m. during 1934, it averaged 0.005 p.p.m. for the year 1949 or approximately an 80 percent reduction. Why not make reference to the table previously referred to as an indicator of possible improvement? In fact, this table appears to be the principal source of information on lead in water since 1932.

In Report on Water Pollution, Appendix to Sub-Basin D, Spokane River Basin dates or years whichever is available should be shown with the following tables:

Page 16, Appendix D - Table No. 2
Page 17, Appendix D - Table No. 3
Page 17, Appendix D - Table No. 4
Page 19, Appendix D - Table No. 6
(Year not clearly shown on copy)
Page 19, Appendix D - Table No. 7.

We are particularly interested in the preceding tables as they indicate why swans and other species of waterfowl die in the vicinity of Harrison, Idaho and elsewhere from lead poisoning. It would appear that if the information contained in the tables referred to was gathered in the years 1931 and 1932 that sampling of soil incrustations and waters should again be repeated at the same locations to determine if there has been an improvement.

We suspect there has been some improvement since 1932. This would be due to the dredging operations at Cataldo Mission Flats and also in part to a higher recovery of mineral content by improvements in milling processes since 1932, however, only an accurate and continuing survey throughout the year would determine this question.

The "Sand Fill Process" adopted by the Day Mines Company at their Dayrock mine for disposal of 85 percent of the mill tailings back into the mine seems to hold the greatest promise for satisfactory disposal of tailings. This has been described fully on pages 36 and 37 of the report. This process has other advantages by increasing the safety through better wall support and by reducing the fire hazard.

We hope that other mining companies in the Coeur d'Alenes will become interested to the extent that they will adopt this method of back filling.

Very truly yours,
/s/
Stephen M. Shelton
Regional Director
Region II

COPY

UNITED STATES
DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Pacific Region

Swan Island
Portland 18, Oregon
February 12, 1951

Officer in Charge
Public Health Service
Division of Water Pollution Control
Swan Island, Building #24
Portland 18, Oregon

Dear Sir:

We have carefully reviewed your Report on Water Pollution Sub-Basin 3, the Spokane River Basin. We have no suggestions nor comments to offer and concur in the report as presented.

We wish to thank you for the opportunity of reviewing the report.

Very truly yours,

/s/
Harold E. Tower
Acting for
J. H. Christ, Regional Director